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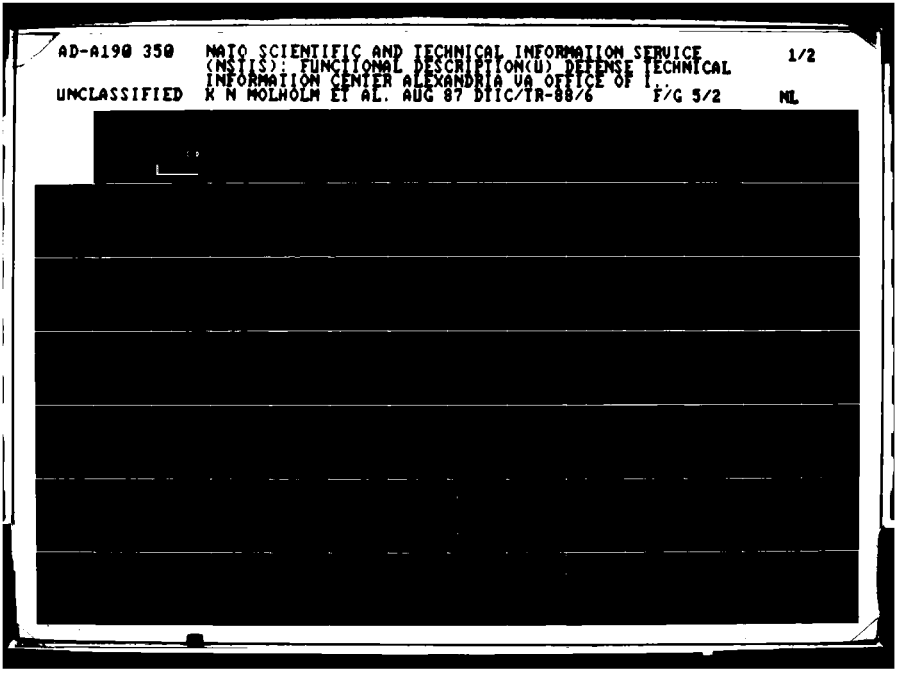

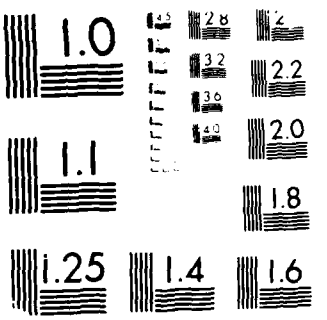

NATO SCIENTIFIC AND TECHNICAL INFORMATION SERVICE (NSTIS): FUNCTIONAL DESCRIPTION

August 1987

U.S. Department of Defense
Defense Technical Information Center
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This report provides a functional description of the requirements for a NATO Scientific and Technical Information Service (NSTIS). The user requirements and much of the background information in this report were derived primarily from interviews with more than 60 NATO Headquarters staff members between 2 March and 25 March 1987. In addition, representatives of the Supreme Headquarters Applied Powers Europe (SHAPE) Technical Centre (STC), the Supreme Allied Commander Atlantic (Anti-Submarine Warfare Research) Centre (SACLANTCEN), the NATO Communications and Information Systems Agency (NACISA), The Advisory Groupfor Aerospace Research Research and Development (AGARD), the U.S. Defense Technical Information Center (DTIC) and the Technical Documentation Center for the Armed Forces in the Netherlands (TDCK), were interviewed, either in person or by telephone.

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FOREWORD

In April 1986, a report entitled "Proposal to Establish a NATO Scientific and Technical Information (STI) Service" was produced by a Working Group of the Advisory Group for Aerospace Research and Development (AGARD) Technical Information Panel (TIP). That report provides a concept description concerning the establishment of a NATO Scientific and Technical Information Service (NSTIS). It is available form the Defense Technical Information Center as AD-B114 110.

This report is a follow-on to the conceptual description and provides a functional description of the NSTIS. This report was compiled and reviewed by the following personnel:

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SECTION 1

NATO SCIENTIFIC AND TECHNICAL INFORMATION SERVICE FUNCTIONAL DESCRIPTION -- EXECUTIVE SUMMARY

1.1 INTRODUCTION

As a result of one of the recommendations of NATO/AGARD Working Group-01, concerning the proposal to Establish a NATO Scientific and Technical Information Service (NSTIS), a Functional Description study was conducted at NATO Headquarters (HQ), March 3-25, 1987. This section summarizes the report.

The user requirements and much of the background information in the Functional Description report were derived primarily from interviews with more than 60 NATO HQ staff members between 2 March and 25 March 1987. In addition, representatives of the Supreme Headquarters Applied Powers Europe (SHAPE) Technical Centre (STC), the Supreme Allied Commander Atlantic (Anti-Submarine Warfare Research) Centre (SACLANTCEN), the NATO Communications and Information Systems Agency (NACISA), the Advisory Group for Aerospace Research and Development (AGARD), the U.S. Defense Technical Information Center (DTIC) and the Technical Documentation Center for the Armed Forces in the Netherlands (TDCK), were interviewed, either in person or by telephone.

1.2 PURPOSE OF THE FUNCTIONAL DESCRIPTION

This functional description for establishing the NATO Scientific and Technical Information Service (NSTIS) provides:

- The user requirements to be satisfied that will serve as a basis of understanding to guide succeeding phases of the process,
- Requirements for policies and practices concerning the scope, products, and services of the NSTIS,
- A work breakdown structure for the NSTIS, documenting all required functions, processes, and capabilities, and

- Identification of processes for NSTIS implementation.

1.3 BACKGROUND

In early 1982, the National Delegates Board of the Advisory Group for Aerospace Research and Development (AGARD) became concerned with delays in the transmission of classified scientific and technical information (STI). AGARD asked its Technical Information Panel (TIP) to investigate. TIP found that problems regarding STI were far broader than those concerning the transmission of classified material. TIP's initial investigation led to the organization of a symposium on NATO STI management in 1984. The participants recommended establishing a working group to evaluate the feasibility of establishing a NATO Scientific and Technical Information Service (NSTIS). The working group verified the feasibility and desirability for establishing the NSTIS in a concept paper released in April 1986.

In December 1984 the Military Committee requested that AGARD/TIP form such a group. In January 1985, the TIP established the NATO/AGARD Working Group-01 (WG-01) which was formally approved by the AGARD National Board of Delegates in March 1985. The results of their investigations, conducted throughout 1985, were issued in April 1986 as a "Proposal to Establish a NATO Scientific and Technical Information (STI) Service."

The proposal describes a conceptual model for an NSTIS and outlines a series of steps for implementing it. On 24 September 1986, the Military Committee recommended that the next step — a requirements definition study — be performed.

The United States offered to assist in the Functional Description phase by allocating US$90,000 to provide expert knowledge. In coordination with the SITCEN, a team of U.S. experts, headed by a senior member of the Defense Technical Information Center, convened at NATO HQs from 2-25 March to conduct interviews, analyze the situation, and make recommendations.

1.4 SUMMARY OF USER REQUIREMENTS

STI needs expressed by multiple users identify the following general requirements:

- Automated databases of STI so that NATO staff members can access the collection from their individual workstations.

- Multiple access points to STI (e.g. multiple subject terms, authors, and originating organizations).

- Individually indexed STI documents, including significant attachments to other documents.
- Common cataloging rules and procedures for all NATO STI material.
- Access to commercial STI databases and others that include news, political, economic, and military information.
- Access to NATO nation STI through national channels.
- Services and printed products that proactively disseminate knowledge about material in the databases.
- Document ordering services to acquire both NATO and external STI.
- Create a database of past and present NATO STI documents and R&D projects.
- Professional expertise to help staff members access both external and internal STI.
- Database(s) of past and present NATO and joint-national R&D or armaments development projects.
- Coordination of information regarding military needs with R&D and armaments development.
- Access to information regarding the threat capabilities of Warsaw Pact weapons systems.
- Reduced redundant processing of STI in NATO.
- Coordination of separate, but similar, document processing efforts (e.g., registries, NSIB, and office automation).
- Exploitation of new technologies in processing STI.
- Reduced redundant R&D among the NATO nations.
- Improved quality of R&D through sharing talent and expertise.
- Improved R&D and operational efficiency armaments through greater standardization of R&D practices and the weapons themselves.

1.5 NSTIS OBJECTIVES

The NSTIS goal is to improve the awareness and exchange of STI. The NSTIS will be an information service, not a library. It will not replace the registries or other organizations as the producers and distributors of the information itself. The NSTIS is expected to complement these organizations, assist in the formation of NATO-wide policies, and exploit new technologies for all types of NATO information.

There are seven NSTIS objectives:

1. Improve cost-effective access to NATO STI.

2. Provide access to external STI.

3. Enhance NATO corporate memory and knowledge of STI.

4. Improve coordination of STI activities to reduce the chance of duplicating scientific research.

5. Improve coordination of NATO military needs with armaments development and R&D efforts.

6. Assist in the development of NATO information management policy.

7. Improve cooperation among member nations in the exchange of STI.

These objectives are important and attainable. They enable STI and other information to be used in ways that will both save money and increase the effectiveness of NATO. (SeeTable 1-1 for more detailed information.)

1.6 COSTS

Two major cost areas are associated with the establishment of the NSTIS: start-up costs, which include such costs as site preparation, purchase of hardware and software, staffing, cataloging and file loading; and continuing operational costs, which include such costs as salaries, maintenance and consumables. Low-end costs for start-up of the NSTIS are estimated at US$525,500 (21.02 million Belgion francs); high-end costs are estimated at US$661,500 (26.46 million Belgian francs). Continuing operational costs are estimated as US$40,000-$65,000 (1.6 million to 2.6 million Belgian francs). These costs, including the assumptions on which the figures were based, are discussed in detail in Chapter 5.

TABLE 1-1

HOW NSTIS OBJECTIVES MEET USER REQUIREMENTS WITH PROPOSED SERVICES AND PRODUCTS AND PROVIDE IMPROVEMENTS TO STI DISSEMINATION

NSTIS objective	To meet user requirement	With proposed NSTIS service, product, or both	To improve STI dissemination
Improve cost-effective access to NATO STI	• Create automated databases of STI so that NATO staff members can access the collection from their individual workstations • Provide multiple access points to STI (e.g., multiple subject terms, authors, originating organizations) • Index documents individually, including significant attachments to other documents • Establish common cataloging rules and procedures for all NATO STI material	• Demand searching of NSTIS and other NATO STI databases • New NATO STI accessions listing	• Expend fewer manhours in identifying and retrieving NATO STI documents • Provide access to citations and, eventually, to full text by end users for wider STI dissemination
Provide access to external STI	• Access commercial STI databases and others that include news, political, economic, and military information • Coordinate access to NATO nation STI through national channels	• Demand searching of commercial and NATO nation databases • Document ordering • Identification of STI resources • Bibliographies on significant topics • State-of-the-art bibliographies	• Professional staff members are more likely to be aware of developments in their fields of expertise in non-NATO sectors • More comprehensive STI knowledge can be made available • The NATO staff will be able to consider methodologies used in the commercial and governmental sectors • Reduce time spent in identifying optional study methodologies
Enhance NATO corporate memory and knowledge of STI	• Provide services and printed products that proactively disseminate knowledge about material in the database • Provide document ordering services to acquire both NATO and external STI • Create a database of past and present NATO STI documents and R&D projects • Provide professional expertise to help staff members access both external and internal STI	• Demand searching of NSTIS, other NATO, commercial, and NATO nation databases • Document ordering • Identification of STI resources • Selective dissemination of information • Directories and lists of people in science and technology	• Provide new NATO staff members with an information base • Contribute to project continuity and understanding across NATO agency boundaries • Provide professional expertise to assist the staff in accessing both external and internal STI • A base of more complete information leads to better decisions

TABLE 1-1 ... Continued

NSTIS objective	To meet user requirement	With proposed NSTIS service, product, or both	To improve STI dissemination
Improve coordination of STI activities to reduce the chance of duplicating scientific research	• Create a database of past and present NATO and joint-national R&D or armaments development projects	• Demand searching of the NSTIS RIP database • Symposia on selected topics • List of new NATO RIP projects • State-of-the-art bibliographies	• Reduce expenditures for duplicative R&D efforts and become better able to identify areas that require greater R&D resources • Provide a better foundation for project initiation by knowing what projects and documents have gone before
Improve coordination of NATO military need with armaments development and R&D efforts	• Coordinate information regarding military needs with R&D and armaments development • Information regarding future plans for military needs and R&D efforts is not easily correlated	• Demand searching of the NSTIS RIP database • Coordination of NATO military needs with R&D efforts • Bibliographies on significant topics • Access to a threat database	• Improve the correlation of NATO Military Commanders Long Term Planning Areas with R&D efforts • Improve the linkage between the Conceptual Military Framework and R&D efforts
Assist in the development of NATO information management policy	• Reduce redundant processing of STI within NATO • Coordinate separate, but similar, document processing efforts (e.g., registries, NSIB, and office automation) • Exploit new technologies in processing STI	• Symposia on selected topics • NSTIS performance studies	• Reduce redundancy in information processing • Assist with NATO systems planning concerned with future technologies • Promote integration and cooperation in system planning within NATO
Improve cooperation among member nations in the exchange of STI	• Reduce redundant R&D between the NATO nations • Improve the quality of R&D through sharing talent and expertise • Improve both R&D and operational efficiency of armaments through greater standardization of R&D practices and the weapons themselves	• Demand searching of NSTIS databases • Document ordering • Symposia on selected topics • Directories and lists of people in science and technology	• Reduce expenditures nationally on redundant R&D • Improve the quality of R&D efforts by sharing talent and expertise • Improve standards for STI management and dissemination throughout NATO

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1.7 ISSUES TO BE RESOLVED

Both the NATO/AGARD Working Group-01 and the Functional Description study team came to one important conclusion: that within NATO Headquarters and throughout the NATO organizations there is no overall policy or direction concerning the controlled dissemination and use of NATO-produced scientific and technical information.

At this point in the development of the NSTIS, it is incumbent upon NATO HQs to make a commitment to establish an information specialist post to resolve such issues as:

1. Where will the NSTIS be placed, organizationally and physically?

2. What will the NATO policy be on the handling and dissemination of NATO-generated scientific and technical information?

3. Who will make milestone decisions in the organizational and system specifications as the development of the system progresses?

4. Who will ensure there is consonance and standardization in the systems developed?

5. What scientific and technical information resources *external to* NATO HQs will be accessed and used?

6. What should be the classification of the database(s), initially and long-term? This will be dependent upon which users are given access and upon which external data resources are to be accessed..

These are but some of the issues that must be determined, defined, and resolved as not only NSTIS information policy but, in fact, as NATO information policy. These issues must be decided at this stage of development so that the NSTIS and other information handling projects will rest on a firm foundation.

1.8 RECOMMENDATIONS

As a result, and in conjunction with the Functional Description study and report, the following recommendations are made:

1. Establish an A level Information Specialist post of NSTIS manager, the incumbent, upon appointment, to ensure development is in consonance with the Registry Support System, NSIB, and SITCEN, and upon reaching operational capability, to manage and operate the NSTIS.

2. Place the Information Specialist post of NSTIS manager initially in the Executive Secretariat, at least until the main policy and procedure issues have been resolved. Then consider placing the position in the Defence Support Division.

3. Establish additional posts to support the NSTIS manager — namely, information specialists and clerk/data input staff.

4. Accept the Functional Description as the basis for the system requirements.

5. Budget for purchase of required equipment and for defraying annual operating costs, as indicated in the Functional Description and as found to be necessary.

6. Begin the next phase in establishing the NSTIS.

SECTION 2

SYSTEM SUMMARY

2.1 BACKGROUND

STI can be defined as:

> Communicable knowledge or information resulting from or pertaining to the conduct and management of research and engineering efforts. STI is used by administrators, managers, scientists, and engineers engaged in scientific and technological efforts and is the basic intellectual resource for and result of such effort.[1]

The availability of STI to the scientists and engineers of NATO and the member nations is key to maintaining the Alliance's technological superiority over the Warsaw Pact.

Though extensive amounts of STI are generated within NATO, there has been no coherent policy for dealing with STI. STI generated by NATO is frequently disseminated via a distribution list and then stored away in archives. There are few announcement mechanisms and no way to maintain a document's visibility over any appreciable period of time.

Staff rotation is another cause of the "invisibility" of the documents; there are no tools to help an incoming staff member assimilate his predecessor's knowledge of the documentation and previous work. Obviously, the situation worsens with each succeeding replacement, especially because the workload is increasing in both size and technical complexity.

NATO staff members find that it is not only NATO STI that is difficult to obtain. In the public and commercial worlds, as well as within NATO nation defense establishments, there is a wealth of STI data that would be of great value to the Alliance if it were generally accessible.

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[1]U.S. DoD Directive 3200.12. *DoD Scientific and Technical Information Program*. 15 Feb 1983. Encl. 4.

Concern regarding these problems had been expressed for a number of years. Consequently:

> In March 1982 the National Delegates Board of AGARD expressed its concern about delays in the transmission of classified scientific and technical information within the NATO community. The Board asked the Technical Information Panel (TIP) to investigate the problem. The efforts of the Panel revealed a general feeling of dissatisfaction both in the NATO member nations and within the NATO organization itself about the way research and study information . . . was handled not merely with regard to timeliness.[2]

One result of the panel's investigation was the organization of a 2-day meeting on "Management of Scientific and Technical Information in the NATO Community and the NATO Nations." This meeting was held in Rotterdam, The Netherlands, on 3 - 4 October 1984. The participants confirmed the problems regarding STI handling, and addressed two recommendations to the NATO leadership:

> 1. NATO should establish its own scientific and technical information service. . . . It will be necessary for each producer of scientific and technical information within NATO to add this service to its distribution list.
>
> 2. NATO should establish a working group with representatives of the major interests involved, this group to verify the feasibility of such an arrangement, to assess and report upon the quantities of information to be handled, the services required, and the resources to implement them effectively.[3]

In December 1984 the Military Committee, through the Director of the International Military Staff, requested that AGARD/TIP form such a group. The TIP established the NATO/AGARD Working Group-01 (WG-01) in January 1985 and formally approved by the AGARD National Board of Delegates in March 1985. The results of their investigations, conducted throughout 1985, were issued in April 1986 as a "Proposal to Establish a NATO Scientific and Technical Information (STI) Service" (Reference: TIP/WG-01).

The proposal describes a conceptual model for an NSTIS and outlines a series of steps for implementing it. As a result of a briefing on 7 May 1986 to the Military Committee, on 24 September 1986, the Military Committee recommended to the

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[2]*Management of Scientific and Technical Information in the NATO Community and the NATO Nations*. AGARD Conference Proceedings No. 370. Jan 1985. p. vii.

[3]*Management of Scientific and Technical Information in the NATO Community and the NATO Nations*. p. xiii.

Secretary General of NATO that the next step – a requirements definition study – be performed.

DTIC provided the funding and oversight for the study which was conducted by LMI in conjunction with the NATO SITCEN and the Armaments and Standardization (A&S) Division of the IMS. Much of this FD was derived from a series of interviews and fact-finding activities conducted at NATO Headquarters in March 1987.

The study results are reported in this FD. It reviews the present user and automated data processing (ADP) environment with regard to STI, and based on the user interviews, details proposed products and services for the NSTIS. If NATO management continues to concur in the need for the NSTIS, the next step should be a detailed system design and development phase to define how best to implement the requirements defined in this document in conjunction with other parallel automation plans.

2.2 EXISTING METHODS AND PROCEDURES

This section describes the users and generators of STI in NATO, particularly at NATO Headquarters, and describes their STI requirements. It then describes present methods for handling STI and present automation projects which have a bearing on the NSTIS.

2.2.1 NATO Users and Generators of STI

NATO has many users and generators of STI, both at Headquarters and at other centers. The NATO/AGARD WG-01 1985 survey of NATO estimated that the Scientific and Environmental Affairs Division (SEAD) generated some 2,000 items a year, and the rest of NATO produced an equal number. The requirements definition team did not repeat the survey, but interview results indicate that the annual volume of STI probably exceeds what was listed in the WG survey. The NATO organizations that use STI are discussed in the remainder of this subsection.

2.2.1.1 Defence Support Division

The Conference of National Armaments Directors (CNAD), through the Defence Support Division, promotes and coordinates joint R&D and armaments development projects among member nations. In some cases, NATO itself funds the

early stages of a project. The Division may coordinate as many as 100 projects at a time. In the Defence Research Group alone, there are eight panels supporting a total of 56 subgroups. Within these, approximately 500 of the 700 participants from the member nations are scientists and engineers. In addition to monitoring specific projects, most of these regular groups sponsor annual meetings on topics of interest.

There are also special groups, such as the National Armaments Directors Representatives (NADREPs) Ad Hoc Group on the Exploitation of Emerging Technologies in the Long Term. To better exploit "emerging technologies in order to reverse the erosion of the West's technological edge over the Warsaw Pact," the group established two objectives:

> . . . first, to reach accord on a list of technologies considered important . . . and second, to identify and gain agreement, by interested nations, to proceed on specific cooperative advanced development projects.[4]

The final report of the Ad Hoc Group is particularly interesting with regard to NSTIS requirements. It stresses the need for NATO international cooperation in these advanced R&D areas, and correlates NATO military requirements as expressed in the major NATO Commanders supporting documents to the Conceptual Military Framework with 183 proposed emerging technology studies submitted by the nations.

Collectively, the subgroups of the CNAD three main armaments groups, the Air Defence Directorate, and the Defence Research Group produce more than 1,000 STI related documents a year. These include a variety of documents including: formal R&D research reports, meeting minutes, (usually with important papers and presentations attached) and project status reports.

STI needs can be generally divided into two categories of use – by scientists and engineers, and by managers. Scientists and engineers need STI to assist them directly with their projects and to help them stay current in their areas of expertise. Managers need to keep abreast of their projects, related projects in other areas, results of previous projects, and requirements for new projects. They must also maintain technical proficiency in their areas of responsibility.

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[4] *NADREPS Ad Hoc Working Group on the Exploitation of Emerging Technologies in the Long Term – Report to the CNAD.* Volume I. AC/259-D/1187. Dec 1986. p. 2.

Within the Defence Support Division, the bulk of the scientists and engineers participating in panel meetings and projects are from the member nations and derive their STI support from their own national defense establishments. The NATO staff members who coordinate these panels are composed primarily of managers, and the immediate priority of the NSTIS should be for services addressed to them.

Before new projects begin, the NSTIS should provide the Defence Support Division staff with reviews of NATO and external STI literature and information about research in progress. Literature reviews can prevent repetitious work, such as the concurrent STC "RUMER" and AAS20 studies of Tactical Ballistic Overtarget Requirements. The results can also identify related work; for example, Remote Piloted Vehicles are of interest to all three armaments groups. Once a project begins, the literature or project review can also serve as a baseline of information for the project scientists and engineers. The reviews should cover NATO STI, applicable commercial resources, and optimally, national defense material of participating member nations. Literature searches cannot only identify what has been done but also identify gaps in the R&D program, thereby verifying the need for new symposia or projects.

Members of the armaments groups – and other NATO staff members as well – expressed a need for threat capabilities data on Warsaw Pact weapons systems. The availability of such data is of obvious value, both for evaluating potential projects and for selecting performance characteristics for Allied weapons systems in joint development projects.

Within NATO – particularly in military staff positions – turnover is a significant problem. With civilian positions the problem is less critical, but still a problem. An illustration: During the period of our interviews at Headquarters, the head of the Defence Research Group was leaving, with no successor appointed; the Director of Armaments and Defence Research had only recently occupied his post and the newly appointed Director of the Defence Support Division had not yet arrived. Continuous turnover in key technical management positions is a fact of life in NATO, requiring the development of alternative forms of STI corporate memory.

2.2.1.2 Scientific and Environmental Affairs Division

The SEAD of the International Staff (IS), through its research grants, is the most prolific generator of STI within NATO, publishing a total of 2,000 items a year

including an average of 100 books. Even more material is released through its Scientific Exchange Program (though this material is not directly associated with NATO). Since the SEAD's responsibilities are within the sphere of NATO's interest to serve the social needs of the member nations, the resulting STI is entirely unclassified and tends to be in areas of pure research. As such, it has little direct military application, although some SEAD-sponsored research has been of interest to SACLANTCEN and the Defence Research Group.

The SEAD differs from other NATO organizations in another respect. Its STI is commercially published and is available, both as books and as citations, in commercially available databases.

SEAD staff members are primarily responsible for administration and management of the civil research grant program. As such, they have no need for military-related STI; but access to commercial STI databases is desirable to aid in selecting the most useful requests for research grants, and to assist the Division Director in his responsibilities as scientific advisor to the Secretary General. This would be particularly useful during such significant events as the Chernobyl accident. Access to external information resources could be used to gather the latest information on such events and to provide background data for assessments of potential impact and for NATO briefings.

2.2.1.3 Infrastructure Directorate

The Infrastructure Directorate is responsible for developing installations needed for support of NATO of military forces. Fifty engineers in the directorate monitor the technical aspects of projects costing more than US$1.5 billion annually.

The Directorate's work does not generate a significant volume of STI, but access to STI is required. Directorate employees need access to such information as the Standardisation Agreements (STANAGs), to determine the characteristics of Allied military equipment so that they can evaluate requirements for the supporting installations. Access to information regarding the capabilities of Warsaw Pact equipment and munitions would help enhance the survivability of Allied installations. Access to external STI relating to such subjects as construction, engineering, and electronics would also assist in the cost-effective management of these projects.

2.2.1.4 *The Military Agency for Standardisation and the Armaments and Standardization Division*

The Military Agency for Standardisation (MAS), which is directly responsible to the Military Committee, is concerned with standardizing the procedures of the NATO forces and of the equipment provided by member nations. This agency promulgates Allied Publications (APs) and STANAGs, which are important to many NATO users – including STI users. These documents are, among others, the core of another NATO automation project, the NSIB.

The A&S Division of the IMS links the requirements of the NATO military authorities to the R&D and project-related work of the Defence Support Division.

To support the efforts of both the MAS and A&S Division, access to NATO STI, particularly STI produced by the Defence Support Division and the STC, is needed. The MAS is particularly interested in new weapons systems developments to assess the effects on STANAGs. The A&S Division sees computer technology as a way of linking Conceptual Military Framework documents and other military requirements documents to Defence Support Division work and to better coordinate NATO military needs with joint national development projects. One step in this direction was taken with coordination by the Ad Hoc Group of 183 national submissions for Emerging Technologies studies (see Subsection 2.2.1.1,"Defence Support Division") with major NATO Commanders Long Term Planning Areas, in order to be able to select the best set of proposals for development of joint R&D projects in these areas.

2.2.1.5 *Communications and Information Systems Division*

The Communications and Information Systems (CIS) Division of the IMS represents 10 specialized committees or agencies that give technical advice on such matters as communications security, tactical communications, and radio frequencies. The Allied Radio Frequency Agency (ARFA) was selected to represent the STI interests of the division by the NSTIS study team. ARFA performs R&D on radio frequency for use by NATO commands, recommends actual frequency assignments for selected organizations, and models frequency usage and events. ARFA generates approximately 20 technical reports a year and organizes a symposium every 2 years.

ARFA staff members have expressed a critical need for access to external STI on electronics and communications. Required information is known to exist in

national defense databases, commercial databases (such as INSPEC), and journal literature but is difficult to obtain through present channels and resources. Such literature is critical to the staff's understanding of the technological state of the art and specific information in key areas. Such information can reduce the time ARFA staff members spend developing techniques that already exist. This is particularly important in modeling, where the group makes significant use of its strictly limited manpower and SITCEN computer resources.

2.2.1.6 Other Headquarters STI Users

The preceding subsections describe some of the NATO groups with larger numbers of users and generators of STI in the Headquarters building. Interviews with other user groups in the building included: the Intelligence, Plans and Policy, and Logistics and Resources Divisions; the Directorates of Information and Economics; and the Tri-Services Group on Communications and Electronic Equipment. [See Appendix C for a complete list of the individuals interviewed.] These groups expressed two additional needs.

The Intelligence Division and the Directorates of Information and Economics all require access to external information resources and databases. They are particularly interested in resources dealing with current events and sociological, political, and military information in Europe and related areas, such as the Middle East. Though this information may not be specifically STI, the means for accessing it are identical to those for accessing external commercially available STI, and we have therefore included the requirement in our report.

The Logistics Branch of the Logistics and Resources Division has among its responsibilities monitoring the logistical requirements and plans of the NATO commands. The commands hold many meetings and release documentation relating to both technical and planning aspects of logistics. Online access to these documents, as well as to logistical information in other databases, would assist the operations of this group.

2.2.1.7 Summary of User Requirements

This subsection summarizes the STI needs identified by specific NATO organizations in the preceding subsections and provides further general requirements (and the rationale for addressing them) that were identified by multiple users. The following requirements were identified:

- Create automated databases of STI so that NATO staff members can access the collection from their individual workstations.
  - Provide follow-on visibility of STI after initial distribution.
  - Reduce the time professional and registry staff spend identifying documents of interest.
- Provide multiple access points to STI (e.g., multiple subject terms, authors, and originating organizations).
  - Documents can currently only be retrieved consistently by a single subject code and NATO reference number.
- Index STI documents individually, including significant attachments to other documents.
  - Currently important briefings, presentations, reports, etc. attached to other documents are not indexed and therefore become "invisible".
- Establish common cataloging rules and procedures for all NATO STI material.
  - The organizations handling STI currently (IMS and IS Registries, STC, SACLANTCEN, etc.) all have different subject coding and cataloging rules. This diversity of rules makes it difficult for users to identify documents.
- Access commercial STI databases and others that include news, political, economic, and military information.
  - The quality and efficiency of the work performed by several groups including ARFA, the Infrastructure Directorate, the SEAD, and the Division of Political Affairs would be improved through access to the most current information in their subject areas.
- Coordinate access to NATO nation STI through national channels.
  - Aside from certain groups – e.g., the SEAD and the Division of Political Affairs – the need here is the same as for commercial STI.

- Provide services and printed products that proactively disseminate knowledge about material in the databases.
  - Dissemination is currently performed through distribution lists and routings which can be slow, miss interested parties, and do not perpetuate the information over time.
- Provide document ordering services to acquire both NATO and external STI.
  - Identifying, locating the document source, and actually acquiring the copy frequently consumes valuable professional staff time. This affects staff who are trying to find documents for themselves or are responding to the requests of others.
- Create a database of past and present NATO STI documents and R&D projects.
  - Information frequently does not cross NATO organizational boundaries.
  - Improve the ability of new staff to assimilate the documentation relating to their position.
- Provide professional expertise to help staff members access both external and internal STI.
  - NATO staff are not generally familiar with database retrieval or the various sources of STI (especially external STI). Professional support in this area will both reduce inefficiencies and provide better searching and retrieval results.
- Create a database of past and present NATO and joint-national R&D or armaments development projects.
  - By more rapidly and completely exchanging project information between organizations, the chances of initiating redundant projects are reduced.
- Coordinate information regarding military needs with R&D and armaments development.
  - Military requirements and R&D documentation do not currently refer to one another by any clearly identifiable means.
  - Information regarding future plans for military needs and R&D efforts is not easily correlated.

- Provide access to information regarding the threat capabilities of Warsaw Pact weapons systems.
  - This information can be used to better define the requirements for Allied weapons systems and infrastructure installations.
- Reduce redundant processing of STI in NATO.
  - The various registries (IMS and IS as well as non-Headquarters registries) and STI centers all expend resources to process, retain, and retrieve the same document upon receiving it.
- Coordinate separate, but similar, document processing efforts (e.g., registries, NSIB, and office automation).
  - These centers each use different procedures and techniques for cataloging, storing, and retrieving documents which make it hard for users to identify and find material that is located throughout NATO.
- Exploit new technologies in processing STI.
  - Because STI is handled in the same way as other documentation little or no research is performed to determine ways to improve its utilization and dissemination.
- Reduce redundant R&D among the NATO nations.
  - National defense funds could more efficiently be used through more joint R&D and STI sharing.
- Improve the quality of R&D through sharing talent and expertise.
  - Through the sharing of talent and expertise between the nations, R&D staff become exposed to new ideas and alternative techniques.
- Improve both R&D and operational efficiency armaments through greater standardization of R&D practices and the weapons themselves.
  - Identifying NATO military needs and sharing information and techniques early in the R&D process will improve the level of standardization.

2.2.1.8 Other NATO Users and Generators of STI

The two most sophisticated centers for processing STI in NATO are the STC in The Hague, The Netherlands, and SACLANTCEN in La Spezia, Italy. These two research centers combined have a staff of some 200 scientists and engineers who generate approximately 120 technical reports a year. Both have staff positions

dedicated to STI support through services that include databases of documents and access to external resources, as is suggested for the NSTIS.

Another STI resource that will be available to the NSTIS is now in its planning stages. This is the AC/310 Insensitive Munitions Information Center (IMIC). This center is now a model information analysis center at the Applied Physics Laboratory, Johns Hopkins Laboratory, Columbia, Maryland. The model IMIC has two principal areas of interest – munitions and combat environmental hazard technology. In 3 years, the IMIC will be moved from the Applied Physics Laboratory to NATO Headquarters.

A fourth group, AGARD, is situated in Paris, France. Within the aerospace field, AGARD's charter includes the following missions:

- Recommending effective ways for the member nations to use their R&D capabilities for the common benefit of the NATO community
- Improving cooperation among member nations in aerospace R&D
- Exchanging STI.

AGARD operates nine panels that develop lecture series, conferences, advisory reports, and monographs on a variety of aerospace topics. Most panels issue NATO STI material as a result of their activities. Access to AGARD publications is not available through any NATO database, but indexes of its publications are released periodically.

There are many other NATO agencies in addition to these centers. Chief among them are, of course, the three major military commands. Other organizations include:

- NACISA
- NATO Training Group
- NATO Defense College
- Military Committee Meteorological Group
- NATO Electronic Warfare Advisory Committee.

The time available for the requirements study did not permit an examination of most of these organizations, but it may reasonably be assumed that they generate at least

some STI material and that their needs are at least equal to those identified at Headquarters. Support has been expressed for the NSTIS in a communique from the Directors of SACLANTCEN, STC, and AGARD, to NATO's Secretary General through the Supreme Allied Commander Europe's (SACEUR's) scientific advisor. [The text appears in Appendix D.]

That NATO includes so many organizations in diverse locations, each with specific but often interrelated missions, is additional justification for a centralized and accessible repository of STI material.

2.2.2 Present Methods of Handling STI

Within NATO Headquarters, STI is treated like any other document type. When documents are released, they are distributed by predetermined lists. Such lists usually have standard recipients (such as the national delegations). The releasing organizations can also identify special recipients. The IMS and IS Registries are responsible for distribution. The IS Registry alone maintains more than 400 distribution lists and distributes more than 220,000 copies annually. Included within these distributions are copies sent to the member nations who may, in turn, produce further copies. Illustrative of this is the U.S. registry in The Pentagon, Washington, D.C. which receives 15,000 NATO documents a year and distributes 250,000 copies. To be included in a distribution, a person in one of the nations must arrange to receive the copy through that nation's registry. As a result, people who need access to material frequently receive it late – or not at all.

After distribution, the registries assign the document to a single subject file. [The IMS and IS Registries use entirely different subject filing schemes.] The registry staff members manually update as many as three indexing systems and then store the document. Other than the initial distribution, no announcement is made of the document and there is no way to review a registry's holdings.

When incoming material is submitted to NATO by another organization, the registries review it and assign it to an action officer. The action officer determines a routing and decides whether a response or other action is necessary. The document is then returned to the registry, which initiates any necessary reproduction and routing and then indexes and stores a copy.

Once a document is stored in a registry, the NATO reference number is the only reasonably certain means of retrieving it. Retrieval by subject requires the user to describe the desired subject matter to registry clerks, who then review their subject schemes and search the physical files. The process is entirely manual (except for IMS materials received after 1984 and two pilot projects in IS). Retrieval by other points, such as author, title, or releasing organization, is generally impractical.

These STI handling methods are manpower-intensive, inflexible, slow, and entirely reactive rather than proactive. There are two fundamental issues here. First, the philosophical basis of the registry system has been to preserve document files, retrieving them only as needed. This is acceptable for routine administrative documentation; however, STI achieves its greatest value only if it is made available to the largest number of people who need it (and – for defense applications – that have legitimate access to it). Second, for either archival or information center activities, the technical methods used at NATO Headquarters are outmoded. But change is taking place; a number of automation projects, including the NSTIS, are being initiated. These projects are described in the subsection that follows.

2.2.3 NATO Information Processing and Policy and the NSTIS

To place NATO STI documentation in its proper perspective within general NATO information processing, it is necessary to understand that NATO STI documents are a subset of the documents that are now processed and maintained by the registries. In the near future, STI (and all NATO documents) will be made available for online retrieval by the registries. It is also necessary to consider how it is both similar to and different from other NATO documentation:

Similarities

- Cataloging information about the documents can be the same: author, title, subject, reference number, etc.
- The processing methodologies and personnel skills for extracting the data can be the same: document review by indexers or catalogers, preparation of abstracts, elimination of duplicates, etc.
- The processing methodologies for retrieval and dissemination can be the same: online queries using Boolean logic, printed announcement products, accession lists, etc.

Differences

- STI tends to retain its importance longer and to be retrieved more often.
- An item of STI is more likely to be sought by a diverse and unpredictable set of users.
- STI has a related body of documents (external to NATO) which is equally important and requires similar expertise to access.
- There is a basic difference in the missions of the processing organizations. A registry's main purpose is to preserve and protect the corporate documentation; an information center's mission is to disseminate information proactively to every interested user who is eligible to have it.

From this comparison, two conclusions can be drawn. First, considering the differences between STI and other NATO documentation, there is no capability either at Headquarters or NATO-wide for actively promoting the effective use of STI. Second, in regard to the similarities in the processing of STI and other NATO documentation, current NATO projects to automate the registries and develop the NSIB are of interest to future NSTIS development. While their user goals may be somewhat different, the NSTIS, automated registries, and the NSIB all possess similar document handling and data processing requirements. Exploring the cost savings of joint development of these systems should be considered in the system design and development phase of the NSTIS. The following subsections describe these and other related activities.

2.2.3.1 International Staff Registry

The IS Registry receives approximately 36,000 documents from internal and external sources and distributes approximately 220,000 outgoing copies a year. [The number of originals was not available.] Until now, the process has been entirely manual. In 1987 a project was begun to automate the registry. This is the first phase of a long-term project, and it will enable the registry staff to create and enter a bibliographic citation for every document processed. The citation will include typical bibliographic information: author, title, date, subject code(s), NATO reference number, and related documents. The citations will be entered into a database management system (DBMS) and document retrieval software on the SITCEN computer system. There the citations will be accessible for both production

of printed reports and online retrieval by individual users. Full implementation of the project will increase dramatically the accessibility of registry documents.

2.2.3.2 International Military Staff Registry

The IMS Registry processes approximately 27,000 documents a year. Since 1984, documents received by the IMS have been entered into the "MRX" application developed by SITCEN and operated on a SITCEN computer. MRX provides access to documents through a number of access points, including subjects. The subject filing system used is the NATO Subject Indicator Code (SIC). Codes are assigned by the document originator. These SIC codes were originally developed for classifying messages transmitted within NATO. They constitute a multilevel numbering scheme. There are plans to migrate the IMS Registry system from the MRX application programs to the DBMS/retrieval software that will support the IS Registry once it is automated.

2.2.3.3 NATO Standardisation Information Base

The NSIB is to support NATO's standarization program and will include citations of standardization documents, principally APs and STANAGs and related documents of NATO groups which have implications for NATO standardization activities. This system, which is in the design phase, is also to be supported by the SITCEN DBMS/retrieval software. The NSIB project is the undertaking of the AC/315 NATO Standardisation Group, which is aimed to oversee all NATO standardization efforts. One issue the group is dealing with is the use of subject terms. The group has formed an international panel of experts to advise on the feasibility of utilizing a thesaurus for subject coding the NSIB citations. If a thesaurus is adopted for the NSIB, it represents a possible resource for the subject indexing of NSTIS documents.

2.2.3.4 Office Automation

In the initial implementation of the two registry and NSIB automation projects, the SITCEN-supported databases to serve both will contain citation (or summary) representations of the full documents. The pilot system of the office automation program is being implemented by the Defence Support Group and its subregistry using personal computers (PCs) and CPT equipment which have been established separately from SITCEN resources. SITCEN intends to eventually

acquire the full text of the documents created on office automation equipment and place them on the SITCEN system. The plan includes capturing the full text of documents at the time of creation by tying into an office automation network (comprising PCs and CPT word processing equipment) and transferring the machine-readable text automatically to the SITCEN DBMS. There the full text of all registry and NSIB documents will be available for all kinds of processing, including distribution, reproduction (replacing photocopies), and full-text online retrieval. Another potential association with the office automation project is a system that reads typed text optically from sources both within and outside NATO and creates machine-readable characters that can be placed in a database. This system can also assist in translations between French and English.

2.2.3.5 Other Information Processing Plans

Other automation concepts at NATO Headquarters that do not relate to NATO document processing, but may affect the NSTIS, are plans to access external databases through terminals and telecommunications equipment in the Headquarters building. One such operation already exists in support of the Sovietologist. The Political Affairs and Intelligence Divisions have also expressed interest in accessing remote databases, e.g., ones containing records of articles from various European and North American publications and newspapers. Another related area has been the consideration given to providing NATO's book, photograph, and film libraries with automated support. Such support would assist with routine administrative library functions, as well as create an online catalog of library holdings.

2.2.3.6 Other NATO Information Processing Projects

Other NATO organizations – for example, both STC and SACLANTCEN – have automated support for their STI services. Both centers have databases of the documents housed in their collections and can access external databases. The study team has not been made aware of the status of any other document- or information-related automation projects within NATO, except that SHAPE received recommendations in the fall of 1986 from a consulting firm regarding automation planning for a management information system (MIS).

In the SHAPE MIS plan, requirements for information storage and retrieval software are cited. For example, the need to store correspondence files and documents, support personal computing, and provide database support to automate

resource management activities are highlighted. These requirements are to address the SHAPE MIS goals of improving information flow between key managers, improving control of secure documents, enhancing document and correspondence generation, and providing automation support for staff and managers.

2.2.3.7 NATO Information Policy

Regarding information policy within NATO, the study team can only confirm the observations of the NATO/AGARD WG-01:

> In summary, the Working Group, with regret, feels obliged to make the following observations with regard to information management in NATO:
>
> - There exists no comprehensive, coherent policy for the management of information (scientific and technical, or any other) in NATO
> - There appear to be no general instructions or standards pertaining to the production and dissemination of NATO documents
> - Nobody in NATO is charged with planning and implementing information policy . . .
> - The absence of NATO Headquarters staff with information science qualifications is regrettable.[5]

The WG also commented on information management standards:

> It would be of considerable help both to NATO staff and of the nations if NATO would implement the following fundamental enhancement in regard to its information management.
>
> (1) The application of basic standards to NATO documents, especially:
>
> - Standards for categories of documents. . . .
> - Standards for subject descriptive/indexing.
> - Standards for bibliographic description.
>
> (2) The production of a central listing of all NATO scientific and technical publications accessible by member nations and NATO staff as a regularly updated publication and/or online database. It is highly desirable that this listing also contain subject indexing.
>
> This leads on to another important topic, that of achieving a wider cooperation and improved coordination in NATO's information management. Lack of coordination becomes a more critical problem, as one by one, the various producers of information go their own ways and

[5]NATO Advisory Group for Aerospace Research and Development, Technical Information Panel, Working Group-01. Ref: TIP/WG-01. *Proposal to Establish a NATO Scientific and Technical Information Service*. Apr 1986, p. 11.

> automate their records. Piecemeal automation inevitably leads to costly duplication and incompatibility. There is still time to save the day but a decision in principle to create a unified NATO STI Service must be taken now. This will end uncertainty and stop costly proliferation. Moreover it will ensure that other interested parties – that is, those advocating the establishment of other broadly similar purposes – are brought together to try to work out joint proposals.[6]

The NSTIS study team has found no change in the situation in the year since the WG released its report, except that the various information automation projects are now actually coming into being essentially independently of one another and with minimal contact. This lack of automation coordination is even more acute between major NATO entities such as NATO Headquarters and SHAPE.

2.3 NSTIS OBJECTIVES

This section defines the user requirements identified by the NSTIS study team in the form of a series of objectives to serve all of NATO with STI products and services by the proposed NSTIS:

- Improve cost-effective access to NATO STI
- Provide access to external STI
- Enhance NATO corporate memory and knowledge of STI
- Improve coordination of STI activities to reduce chance of duplicating scientific research
- Improve coordination of NATO military needs with armaments development and R&D efforts
- Assist in the development of NATO information management policy
- Improve cooperation among member nations in the exchange of STI.

2.4 PROPOSED METHODS AND PROCEDURES

This section summarizes the methods and procedures that are further detailed in Section 3, reviews improvements in STI dissemination brought about by establishment of the NSTIS, examines the relationship of the NSTIS to other NATO databases, and comments on the potential effects of future technology.

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[6]NATO Advisory Group for Aerospace Research and Development, Technical Information Panel, Working Group-01. Ref: TIP/WG-01. *Proposal to Establish a NATO Scientific and Technical Information Service*. Apr 1986, p. 11.

More specifically, Subsection 2.4.1 discusses the topics that should be addressed before any NSTIS method and procedure can be determined. The result of recommending an approach to resolve these topics will be the creation of an NSTIS "information policy." As part of the next phase of the evolution of the NSTIS, an approach will be selected and policy established. Subsection 2.4.2 summarizes the methods and procedures for NSTIS operations. Subsection 2.4.3 describes the improvements that NATO should experience in the flow and dissemination of STI resulting from the establishment of the NSTIS. Next, Section 2.5 suggests procedural interactions between the NSTIS and other related NATO databases. Section 2.6 looks ahead to developments in technology and information resources management and focuses on their potential effects on the NSTIS. Finally, Section 2.7 itemizes the assumptions and constraints that will influence design and development of the NSTIS.

2.4.1 Establish NSTIS Information Policy

As part of the system design and development phase, resolution of the issues described below will have to be determined and defined as NSTIS information policy. These issues must be decided at the start so that the NSTIS will rest on a firm foundation:

- How will the NSTIS products and services be phased in to address the critical STI needs of users from within NATO Headquarters, the NATO community, and NATO nations?
- Where will the NSTIS be placed, organizationally and physically?
- What hardware and software will support the NSTIS databases and the generation of products and services?
- What will be the database record structure for describing the contents of an NSTIS database to facilitate retrieval and enable users of the NSTIS to understand the descriptions and use them in their work?
- What types of materials and research-in-progress (RIP)[7] projects will be selected as STI for inclusion in the databases? What will be the classification level(s) of the databases?

[7]Any STI-related project, including "pure R&D" and armaments development – whether by NATO or as a joint national project – are identified collectively in this report as research in progress (RIP). RIP includes planned, ongoing, and completed projects.

- With what previously released STI and RIP projects will the NSTIS databases begin?
- What STI resources external to NATO Headquarters will be accessed and used?

These issues, that will need to be resolved in the next phase, are discussed next.

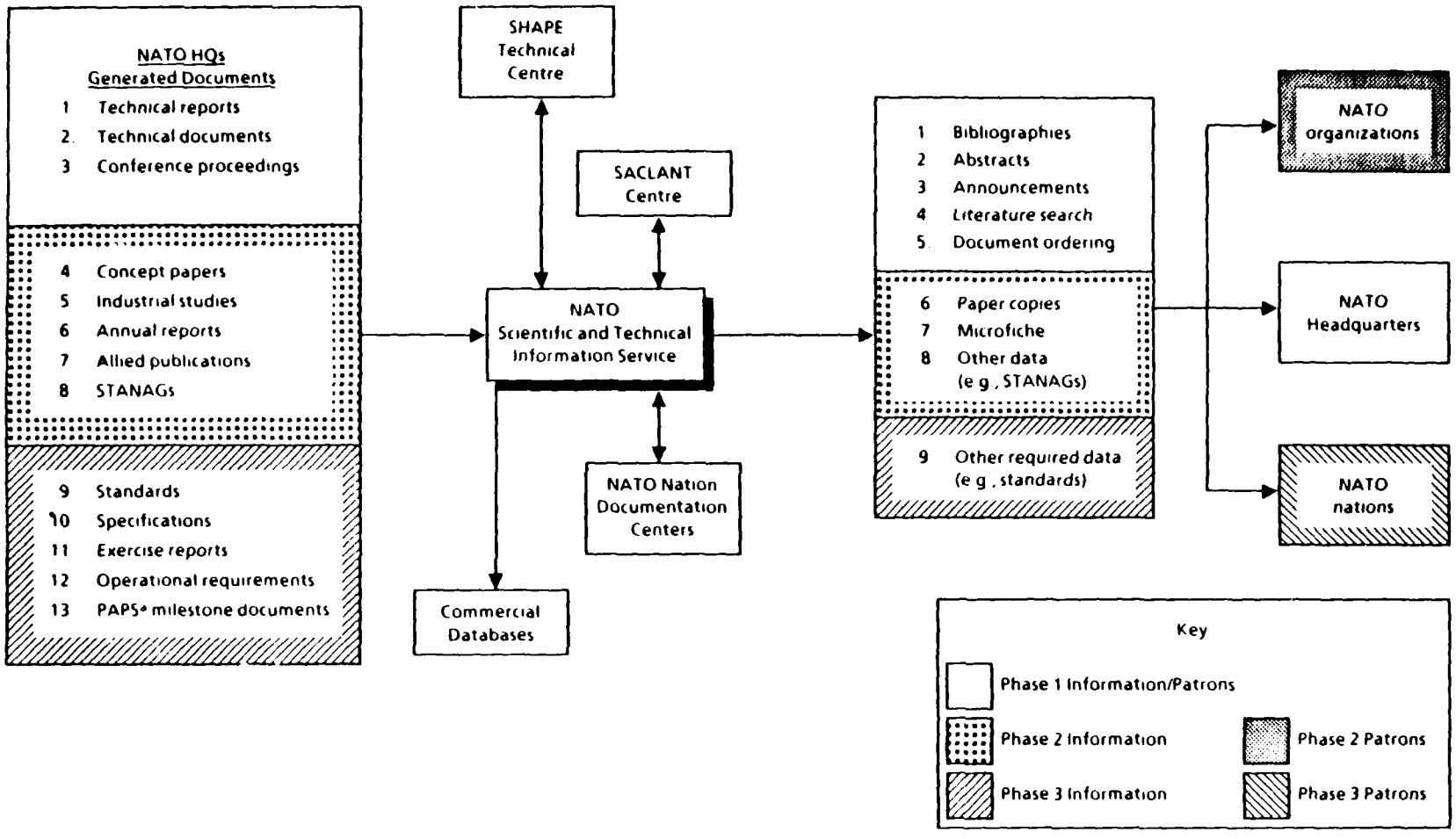
2.4.1.1 Define Priorities

Three user populations are to be served by the NSTIS: NATO Headquarters staff; staffs of other NATO agencies, commands, and centers; and NATO nation users. The priorities for the NSTIS to meet the STI needs of each of these user populations will have to be established. These priorities and their effects on the phased development of NSTIS products and services appropriate to a given user population are to be determined in the next phase.

The NSTIS must plan the staged introduction of information services and products needed to meet user requirements. This phased approach is necessary due to the availability of funds to implement services and provide products. At the proposed staffing and funding levels, the NSTIS should implement services and products that are phased in and, therefore, can be properly supported by available resources. Therefore, to address the most critical user needs, basic services and products should be implemented first. The NATO/AGARD WG-01 report also recommended phased development of the NSTIS as illustrated in Figure 2-1.

Subsection 2.4.2 and Sections 3.3 through 3.6 discuss and make specific recommendations for both basic and enhanced information services and products. In the system design and development phase, each service or product should be assigned a priority for development. How each service or product will be implemented, given the selected priorities, must also be determined. In addition, the means by which future services and products can be proposed, considered, and introduced must also be addressed.

Consideration should also be given to user groups who should be provided with direct access to the NSTIS databases. Users who may conduct their own searches in the NSTIS databases will be determined primarily by the telecommunications capabilities of the system that is selected to support the NSTIS.



Note: Phasing does not imply a suggested priority

* Phased Armaments Programming System

FIG. 2-1. NSTIS PHASED EXPANSION FROM THE NATO/AGARD WG-01 REPORT

NATO UNCLASSIFIED

2.4.1.2 NSTIS Placement

The NATO/AGARD WG-01 report suggested the following approach for organizational placement of the NSTIS:

> The Service should be situated in a part of the NATO organization structure which is responsible for serving the entire organization, not just one sector. . . . The Service must have the facilities to work directly with all parts of NATO and to share resources with the NATO nations. (p. 20)

This suggestion implies that the NSTIS must be organizationally established as part of both the IS and the IMS. Such an arrangement has a precedent in that it is similar to SITCEN. The study team concurs in this approach; the NSTIS needs to serve both the civilian and military sectors of NATO.

The NATO/AGARD WG-01 report also offered ideas for physical placement of the NSTIS:

> The Service should be located near the largest number of users, preferably in NATO Headquarters in Brussels. . . . Closely related to the need for a central location . . . is the requirement for access to communication links, such as mail, electronic messaging, electronic switching. (p. 21)

The NSTIS must have available physical space for at least three or more staff members, equipment for accessing the databases – i.e., terminals (or PCs), printers, and a modem – and a small collection of directories, manuals, and other core reference materials.

Where to place the NSTIS within the Headquarters building for best service to the NATO community will have to be determined in the next phase as part of information policy decision-making.

2.4.1.3 Select the Automated System for Supporting the NSTIS

The system to support the NSTIS – comprised of computers, terminals, storage devices, printers, operating system software, and applications software – will have to be chosen. The requirements for addressing the system needs of the NSTIS are defined in Section 4.2, "NSTIS Requirements," of this report. A number of possible configuration options available for consideration must be assessed in terms of how each meets user requirements and NSTIS objectives.

2.4.1.4 Define NSTIS Database Record Structures

The NSTIS will rely heavily on automated databases. The records for these databases will be entered in a predetermined database record structure. A record structure is comprised of "fields" – for example, "author," "title," "date of publication," and "NATO publication number." Record structures will be needed for the following proposed NSTIS databases: the citation records of NATO-produced STI documents, NATO armaments development and R&D projects (or RIP), query tracking for monitoring user requests, document orders to track hardcopy requests placed by the NSTIS on behalf of a user, user information profiles for supporting the selective dissemination of information service, and NATO staff areas of expertise for directory production and referencing.

These database record structures must be thoroughly analyzed so that before any record is entered into an NSTIS database, the rules for creating that record have been fully determined. If the consequences of a proposed record structure are not carefully analyzed, the services and products created from the NSTIS databases may not meet the user's requirements as fully as possible. Also, the database may not be constructed optimally, detracting from operational efficiency and placing an unnecessary drain on system programming resources.

In Appendix E of this report, the proposed fields and their characteristics for the six database records have been listed. More specific analysis must be provided on how each field should be constructed. For instance:

- Is a field to be of variable or fixed length?
- How will the database incorporate the use of any system-generated record numbers?
- Are there to be a given number of expected (or permitted) subfields within each field?
- Are subfields to be individually indexed?
- What edit checking or validation is to occur on fields in the record?
- What fields are mandatory, i.e., required to have data so that the record can be accepted into the database?

- What are the characteristics of the entries in the fields that will have validation checking; e.g., how will dates be recorded to be in conformance with NATO style and format?
- Are "cataloging" rules needed to govern the approved entry of author or project investigator names, document titles, and other textual fields?

2.4.1.5 Define Selection Criteria of STI Materials and Projects

Selection criteria will have to be devised on how documents and RIP projects qualify as STI for entry into an NSTIS database. Selection criteria will address such issues as document type, release date, and subject matter. The proposed selection criteria are listed in Appendix F.

As per Item 7: "Security Classification" of Appendix F under "NATO STI Documents," the classification of documents appropriate for the NSTIS can be unlimited, restricted, or classified. The issue to be addressed is how the classified documents will be represented in the Citation and RIP databases. Providing unclassified citations to unclassified documents has the advantage of reducing security requirements, but the disadvantage of increasing processing costs and reduced information value. While maintaining classified records in the databases negates these disadvantages, there are increased security requirements and reduced user access to the databases. This decision which also impacts available system configurations, as discussed further in Section 4.3, will be determined in the next phase.

2.4.1.6 Determine Which Previously Released STI Documents and RIP Projects are to be Included in Databases

The NSTIS databases will grow in size and value as newly released STI is added. Annual additions to the Citation and RIP databases are estimated at 2,600 items. When the NSTIS is created, an initial population of current and past STI database records will have to be established. The study team suggests inclusion of all items released in the past 2 years and older material of significant value to NATO. The following two criteria are proposed for evaluating documents and RIP projects that are older than the 2 years normally allowed for placement in the NSTIS databases. Nominations will have to be encouraged by the NSTIS from NATO staff and members of NATO Committees and Panels for older materials that have:

- *Applicability to Current NATO STI Needs* – Documents or projects that report on subjects associated with current NATO STI needs.
- *Overall Historical Value* – Older material of such fundamental significance that it should be readily available, even if no immediate need is perceived.

2.4.1.7 What STI Resources Outside NATO Headquarters will be Accessed

One NSTIS objective is for access to commercial (or publicly available) databases and resources. Decisions will have to be made about which commercial databases are to be initially identified, reviewed, evaluated, and selected for access by NATO. Since NATO users will have to pay for access to these databases, the value will have to be weighed against the charges incurred for access to a given database.

The NSTIS will also need access to other NATO agency data. The databases and document collections of STC, SACLANTCEN, and the registries of other NATO agencies should be reviewed for applicability to the NSTIS objectives. This access will be affected by the technical aspects of the decisions made concerning the hardware environment chosen to support the NSTIS and the telecommunications capabilities that will consequently become available (see Subsection 4.3.2 and Table 4-1).

Another requirement for meeting NATO STI needs is to provide access to NATO nation defense information resources. Establishing such access will be one of the more difficult tasks faced by the NSTIS in fulfilling the user requirement of identifying and obtaining all relevant STI. The databases and collections held by any individual NATO nation in defense information centers are both proprietary and/or sensitive to that nation. Rigorous security standards may have to be addressed before such access is permitted. Conversely, the NATO nations' access to the NSTIS is also a policy concern and will be affected by the technical aspects of decisions about the hardware environment.

2.4.2 Methods and Procedures for the NSTIS

This subsection summarizes the functions to be performed in the day-to-day operations of the NSTIS. Once NSTIS information policy has been determined (see Subsection 2.4.1), the procedures to undertake the major functions of the NSTIS can be refined. These methods and procedures will have to be reviewed as changes occur in the way information services are provided by other defense information centers

and as new technology becomes available. To support all users' knowledge of changes, an NSTIS procedural manual should be created and stored as a word processing document at NATO Headquarters so that it may be modified and reissued when necessary.

This FD provides a preliminary procedural flow and optional approaches for carrying out the following activities:

- Selecting and acquiring NATO STI for the Citation and RIP databases
- Creating the core records and entering them into the NSTIS databases
- Adding subject terms and abstracts to complement the core records
- Maintaining and managing the NSTIS databases
- Submitting user requests for information to the NSTIS
- Retrieving material from available resources and delivery to the requester
- Supporting database searching by end users
- Providing basic and enhanced information services, including establishment of interfaces with external STI resources, i.e., commercially available databases, other NATO information databases, and NATO nation defense information resources
- Providing basic and enhanced information products such as bibliographies, document ordering, and selective dissemination of information
- Conducting performance reviews of the NSTIS so that improvements can be made whenever possible – e.g., how selection of STI materials and the adequacy of descriptions of the STI in the database meet NATO user requirements for information.

How the NSTIS will perform the tasks is described in greater detail in Section 3.

2.4.2.1 Acquire and Select NATO STI Documents and Research-in-Progress Projects

Documents that are prepared by individuals working at or associated with NATO, and R&D projects that are managed by the NATO staff, will be candidates for the NSTIS databases. These materials and projects will be screened against the selection criteria defined by NSTIS information policy. Selection criteria will have to be established for the Citation and RIP databases only. With the exception of the

NATO Expertise database, the other recommended databases are intended primarily for tracking and recording purposes and have no selection criteria.

The NSTIS databases will consist entirely of information generated by NATO or submitted to NATO. For documents and projects outside NATO, services will be limited to identification and acquisition of hardcopy for NATO users.

2.4.2.2 Create Core NSTIS Database Record

Before any record is created, a check will be made for a duplicate record in the appropriate NSTIS database. If not a duplicate, a record may be created in one of several ways – either making an online entry using source materials to identify data for each field, keying from a standard form that includes data for every field, or reading into the database by means of an optical character reader (OCR). The NSTIS must be able to accept records that are transmitted in various media from STC or other information sources.

For the selected documents or RIP projects, a record will be created containing bibliographic citation or project data. Records will also be made of document orders placed on behalf of a user, user information profiles that can be matched against new records of STI documents or RIP projects entering the database, requests that have been posed to the NSTIS, and profiles of NATO staff members including their areas of expertise. The fields for each of the six recommended databases and some of their characteristics are shown in Appendix E.

2.4.2.3 Augment Core Record Data with Abstract and Subject Terms

For two core record types – Citation and RIP – abstracts will be stored in both French and English. Subject terms will be added to these two databases, as well as the Selective Dissemination of Information (SDI) User Profile and NATO Expertise databases. The abstracts and the subject terms will be added to the respective core database record. Who will provide the subject terms and abstracts, as well as the method of entering the data, is yet to be determined.

2.4.2.4 Create, Maintain, and Manage NSTIS Databases

The development of NSTIS information policy will determine how the database records are created. Determination will include selecting the most appropriate

computer system for the NSTIS, defining the record structures for the databases, and deciding which organization(s) will create the database records.

Procedures for modifying database records will also have to be determined. In some instances it may be necessary to replace a record completely, and procedures for replacement must be developed and approved. As an example, as documents that supersede a previous year's issue are completed, records for the year before may have to be deleted and replaced. In other instances, it may be desirable to delete records if retention is no longer warranted.

Over time, changes will occur in the security classification of some records. Therefore, the procedures for downgrading (or upgrading) those records must be understood.

Finally, with changes in NSTIS requirements for serving users, methods of supplementing existing database records will need definition. For example, additional data elements (or fields) may be needed to support creation of new products or services.

Functions for the NSTIS must also provide for the following basic operations: support system maintenance, back-up and recovery, interface between the system user and application programs, and technical interfaces between the NSTIS and other databases and information services.

2.4.2.5 Accept User Requests for NSTIS Products and Services

Users who may submit a request include the NATO Headquarters staff, other NATO agency staffs, or designated NATO nations representatives. The NSTIS should be able to receive requests made in person, by telephone, by mail, by courier, and, depending on the computer resources selected, electronically. Information about a request will be entered into an NSTIS database to support tracking the request. The query tracking database will also help the NSTIS' awareness of such information as its volume of requests, types of users, and nature of requests for management reporting purposes and for review of trends in information needs.

2.4.2.6 Determine Appropriate Response to the User's Request

The NSTIS must determine what form(s) the response to a request may take. Response forms can fall into a number of categories – for instance, a request for a

copy of a document housed in a registry, or a request that requires preparation of a state-of-the-art bibliography. Depending on the complexity of the response and the resources used, a response may take from several minutes to several weeks.

Information concerning the resources that the NSTIS will access to respond to a user query may be added to the tracking record when the query is received (see Subsection 2.4.2.5).

2.4.2.7 Support Searching of an NSTIS Database by an End User

An "end user" is defined as a NATO staff member who wishes to conduct his or her own retrieval from a database. Such demands have grown as more workstations, PCs, telecommunications software, and modems are available, and users become more familiar with this equipment. The substantial increase in the number of workstations and PCs at NATO Headquarters reflects this changing environment.

End user searches into the NSTIS databases must be supported in a different way from searching performed by the NSTIS staff. Even though end users may have in-depth training in using the retrieval commands that enable them to conduct their own searches, it is desirable that the system be more forgiving and instructional, i.e., "user-friendly." Such user-friendly capabilities can be provided by "front end" software (see Subsection 3.3.1 for a fuller discussion).

For end users, access to the NSTIS databases may be supported in one of several environments depending on the choice of computer system resources. More analysis and a final arrangement must be determined in the system design and development phase.

2.4.2.8 Provide Basic and Enhanced Information Services

Information services not only provide tangible products for the user but may also enhance a user's awareness or knowledge of STI by connecting the user to information and resources. Information services are available to users at virtually any time and are not schedule-driven. With some services, such as the organization of symposia, the user may benefit for a long time by being introduced to previously unknown colleagues and resources.

- *Basic Services* – The NSTIS should provide three basic services: (1) demand searching of databases, (2) document ordering, and (3) identifying STI-related resources.

  1. *Demand Searching of Databases* – This function supports demand (or ad hoc) searching of both the Citation and RIP NSTIS databases as well as databases outside NATO Headquarters. The NSTIS will have to institute administrative procedures for coordinating efforts with external information resources. In some cases, actual online searching may not be feasible. For those cases, the following discussion includes the procedural arrangements that may be involved in establishing STI access between the NSTIS and the resources of other NATO agencies and NATO nations. STI access is illustrated in Figure 2-2.

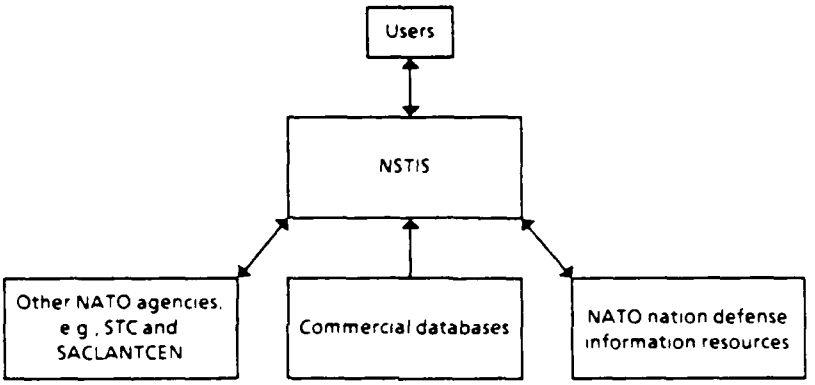


FIG. 2-2. STI ACCESS BETWEEN NSTIS AND EXTERNAL STI RESOURCES

- *NSTIS Databases* – Both NSTIS staff members and trained NATO Headquarters users will be able to search the NSTIS databases. The retrieval capabilities afforded both groups are described in Subsection 4.2.2.2, "Document Retrieval Component." Enhanced (or desirable) retrieval capabilities, also described in this subsection, may be made available to the NSTIS staff only. The NSTIS will have to offer training and continuing consultation to end users who choose to do their own database searching.

  The NSTIS will also have to define the manner in which users outside NATO Headquarters may gain access to the databases. Access will depend on the computer resources selected to support the NSTIS and the decisions made during the development of information policy.

  Users must be able to sort, display, and print, in a variety of ways, records that are retrieved during a search. Required display and formatting capabilities are described in Subsection 4.2.2.3. The

NSTIS staff must be able to further analyze the results of the retrieved records and conduct other sorting and analytic functions on those records. NSTIS staff should be able to supplement the records with annotations.

- *Other NATO STI Resources* – Methods of arranging for information exchange with other NATO agencies must be established. The staffs of STC and SACLANTCEN wish to access the NSTIS databases. How a NATO agency, such as SACLANTCEN, can gain access to the NSTIS will be affected more by technology than by specific security classifications; all NATO staff members with "need to know" should be able to review such material. Depending on the system selected to support the NSTIS, NATO agencies will have various telecommunications capabilities for online access to the NSTIS. Once a system is selected for the NSTIS, the way(s) to serve other NATO agencies – whether by online access or by telephoned inquiry – can be determined. How the selected system will support such access, for both specific user requests and larger volume exchanges of database records, will have to be determined during the system design and development phase.

  For reasons of cost, telecommunications security, document security, and policy, the NSTIS staff may be able to forward information queries to other NATO agencies only when STI in those resources is needed to fill a user's request. The information databases and automated registries of such agencies as STC, SACLANTCEN, and NACISA will require such coordination. The NSTIS may not be able to conduct online searching of these databases, but procedures for submitting, clarifying, and receiving requested information will have to be determined. Which resources are to be used depends on the decision made in the development of NSTIS information policy.

- *Commercial Databases* – Because of cost considerations, on-demand searching of external commercial databases will generally be most cost-effectively performed by trained information professionals in the NSTIS. If telecommunications support for searching by NATO staff members is established, then training criteria that must be met in order for NATO staff who wish to perform their own searches – for example, participating in a course – must be determined.

  One way to assist both NSTIS professional and NATO end users to search these commercial databases might be with "gateway" software. Such software can translate a search request into the language recognized by the database and may also help select a

database that contains the information needed. Gateway software is discussed further in Subsection 3.3.1.3, "Commercial Databases."

Procedures for negotiating contracts and establishing payment accounts with commercial database vendors must be determined. Procedures for adding to the initially selected databases should also be specified. As each account is established, the way(s) in which the NSTIS and the end users who may operate independently of the NSTIS will pay for access time to these databases must be determined.

- *NATO Nation Defense Information Services and Databases* – The NSTIS staff should be able to coordinate requests with a NATO nation's information resources. For both policy and technical reasons, however, the NSTIS may not be able to communicate an information request directly in an online interactive mode to a NATO nation's defense information resource. Coordination must be based on the NATO nation's information policy, which will determine which resources may be accessed, and on the development of NSTIS procedures, which will provide the means of access.

  Requests for information submitted by the NSTIS to these resources will have to be directed through proper official channels. Even with the capabilities offered by telecommunications and gateway software, it is unlikely that the NSTIS or any NATO end user can now establish a direct link with a NATO nation's defense information resource. Requests are most likely to be first reviewed and cleared by one or more designated representatives of the NATO nation at NATO Headquarters. Requesting users will have to demonstrate a "need to know" and the right security authorization before such search requests can be forwarded.

  The NSTIS may contribute to the process by helping the representative to interpret and understand the request before it is forwarded to the NATO nation's information resource. The NSTIS may also be permitted to answer questions on behalf of the requesting user when the NATO nation's information resource is preparing a response.

  The results of a search by a NATO nation's defense information resource are also likely to be reviewed by the representative before release. The process will have to be better understood during the system design and development phase so that workable procedures can be suggested.

2. *Document Ordering* – The NSTIS will not become a repository (or library) of STI materials except for selected core reference materials. However, the NSTIS must be able to provide a user on a "need to know"

basis with a copy of the full text (or hardcopy) of both classified and unclassified STI documents. Requests for hardcopies of documents at NATO Headquarters must be coordinated with the registries that house all documents received by NATO Headquarters and will be treated according to the regulations of the appropriate registry.

Document ordering services for materials not housed at NATO Headquarters must also be provided. For commercial databases, this requirement may be met by contract with document ordering services or database vendors in Europe and North America. Documents from other NATO agencies may be obtained by request to appropriate registries. Requests may be submitted to other NATO agencies online, by telephone, or in writing. The NSTIS will have to register with the document ordering services of NATO nation resources. Interlibrary loan (ILL) services may supplement document ordering services.

Every such order, whether from a NATO registry or from a contracted service, should be tracked (see Subsection 3.3.2, "Document Ordering"). Once a document is received, the NSTIS will not store it or even enter a record of it in its Citation database. It will only deliver the document to the user.

3. *Identification of STI-Related Resources* – There are several areas of information related to the increased awareness of professional activities in science and technology. Such information will include announcements of conferences and symposia of interest to NATO staff. The titles of new monographs or books may also be announced to the NATO staff.

   The NSTIS should establish a small core collection of reference materials – for example, the *McGraw-Hill Dictionary of Scientific and Technical Terms*. This activity should be conducted in conjunction with the existing NATO Library collection.

- *Enhanced Services* – As with enhanced products, these services are to be provided later, when resources are available.

  - *Access to a Threat Database* – Access to information about the capabilities of Warsaw Pact weapons systems is not readily available to NATO Headquarters personnel. Access to database(s) that contain such information would have to be obtained through the member nations or be developed from primary intelligence data. Either process requires substantial coordination and effort.

  - *Symposia on Selected Topics* – The NSTIS can assist other organizations in preparing for symposia, in addition to sponsoring its own

symposia on topics relating to STI processing, by providing information products and services.

2.4.2.9 Provide Basic and Enhanced Products

Initial NSTIS information products will use traditional hardcopy media. Delivery of NSTIS products in alternative media, as its technology capabilities are enhanced, should be considered by the NSTIS in the future. NSTIS products, which are described in more detail in Section 3, should include:

- *Basic NSTIS Products* – Three basic products will assist most NATO users in remaining up-to-date on recent NATO activities in science and technology:
  - *New NATO STI Accessions Lists* – All new records in the NSTIS Citation database will be listed routinely – typically monthly or quarterly – to alert users to newly received STI documents.
  - *Bibliographies on Significant Topics* – Significant events, such as the Iranian deployment of Chinese silkworm missiles, will require the NSTIS to bring together technical and general background material from all available resources quickly in order to be responsive to the information needs of the NATO staff. The NSTIS must be prepared to acquire references to published materials on such topics quickly and to provide hardcopy of all requested material.
  - *State-of-the-Art Bibliographies* – The NSTIS will compile and publish bibliographies that will enable NATO staff members to be apprised of trends in selected areas. Such state-of-the-art bibliographies can direct users to the dialogues and areas of discussion among scientists and engineers.
- *Enhanced NSTIS Products* – Four enhanced products would require additional NSTIS resources and capabilities but would provide NATO users with valuable support.
  - *New NATO Research-in-Progress Projects Lists* – All RIP records that are new to the database will be listed routinely – perhaps quarterly. The list will provide a user with information about recent R&D projects.
  - *SDI User Profiles* – An SDI User Profile may be built by compiling an information needs profile of a NATO user. The objective of an SDI service is to keep the user informed of what is going on in his or her professional field without overwhelming the individual with unwanted information. Such profiles can consist of subject terms from the thesaurus or extracted from the database record's text that are of greatest interest to the user. The user can then be notified of the

acquisition of relevant new documents or the start of new research. Notification is based on matching subject terms in the user profile to those of the records of new STI documents and RIP projects that are added to the NSTIS databases.

Feedback must be built into the SDI User Profile service. Recipients of the SDI service must be asked to notify the NSTIS about changes in their profiles and should be asked to comment on the relevance of the records in their SDI announcements to their needs.

- *Directories and Lists of People in Science and Technology* – These directories would be comprised of records of NATO individuals who have assignments, expertise, or both in given areas of science and technology. Information needed for these directories can be derived from analysis of the author fields of STI or RIP records, combined with reviews of SDI User Profiles. This information must be considered sensitive and restricted.

- *Coordination of NATO Military Needs With R&D Efforts* – Coordination of military needs with R&D efforts can be assisted by the NSTIS through specialized computer products. These products would compare military requirements documentation with R&D documentation and show the status of military requirements being addressed, overlapped from different areas, or not met.

2.4.2.10 NSTIS Performance

The NSTIS can undertake a number of activities to evaluate its performance in meeting its objectives. Only with evaluation and performance assessment can the NSTIS remain responsive to its users and continue to meet its objectives. Evaluation can be performed for one of several audiences: NATO management and budget review entities, NSTIS staff, and NATO users. Performance assessment will require time and staff resources and must, therefore, be chosen carefully and be planned for incorporation into the NSTIS budget. Evaluation is warranted when any of the following questions or issues arise:

- There is evidence that the NSTIS needs expansion or improvement. User demands may overwhelm the NSTIS resources and require accelerated implementation of products and services.

- There is evidence that better procedures or technologies may help the NSTIS become more effective, from the points of view of both technology and cost.

- There is evidence that resources are available to expand or improve the NSTIS and that management is willing to make such modifications.

Each of these situations must be dealt with using available data. For example, when reviewing issue one – evidence that the NSTIS needs expansion or improvement – quantifiable data can be provided by analysis of, for example, turnaround time for responding to queries, breadth of resources available versus resources used, and documentation of feedback elicited from the users and recorded in the NSTIS Query and Order Tracking databases.

2.4.3 Summary of Improvements

When the NSTIS is established and addresses its objectives effectively, a number of improvements will be inaugurated in how STI is acquired, retrieved, and disseminated within NATO. The following is an overview of improvements that the NSTIS information services and products will make in the availability of STI in NATO and the ability of NSTIS to meet its objectives:

- Improve cost-effective access to NATO STI.
  - Expend fewer man-hours in identifying and retrieving NATO STI documents.
  - Provide access to citations and, eventually, to full text by end users for wider STI dissemination.
- Provide access to external STI.
  - Professional staff members are more likely to be aware of developments in their fields of expertise in non-NATO sectors.
  - More comprehensive STI knowledge can be made available.
  - The NATO staff will be able to consider methodologies used in the commercial and Governmental sectors.
  - Reduce time spent in identifying optional study methodologies.
- Enhance NATO corporate memory and knowledge of STI.
  - Provide new NATO staff members with an information base.
  - Contribute to project continuity and understanding across NATO agency boundaries.
  - A base of more complete information leads to better decisions.

- Improve coordination of STI activities to reduce the chance of duplicating scientific research.
  - Reduce expenditures for duplicative R&D efforts and become better able to identify areas that require greater R&D resources.
  - Provide a better foundation for project initiation by knowing what projects and documents have gone before.
- Improve coordination of NATO military needs with armaments development and R&D efforts.
  - Improve the correlation of NATO Military Commanders Long Term Planning Areas with R&D efforts.
- Assist in the development of NATO information management policy.
  - Reduce redundancy in information processing.
  - Assist with NATO systems planning concerned with future technologies.
  - Promote integration and cooperation in system planning within NATO.
- Improve cooperation among member nations in the exchange of STI.
  - Reduce national expenditures on redundant R&D.
  - Improve the quality of R&D efforts by sharing talent and expertise.
  - Improve standards for STI management and dissemination throughout NATO.

Table 2-1 shows how the NSTIS objectives were derived from the identified user requirements and correlated to the proposed services and products.

2.5 RELATION WITH OTHER NATO DATABASES

The NSTIS is one of several activities at NATO Headquarters that requires automation support. In this section and in Section 4.4, we discuss other NATO Headquarters projects that have features in common with the NSTIS.

2.5.1 Common Document Origins

As discussed in Subsection 2.2.3, "NATO Information Processing and Policy and the NSTIS," documents are created on a variety of machines and word processing devices. Hardcopy from all of them, as well as documents generated within NATO Headquarters or submitted to NATO for further distribution, are

TABLE 2-1

HOW NSTIS OBJECTIVES MEET USER REQUIREMENTS WITH PROPOSED SERVICES AND PRODUCTS AND IMPROVE DISSEMINATION OF STI

NSTIS objective	To meet user requirement	With proposed NSTIS service, product, or both	To improve STI dissemination
Improve cost-effective access to NATO STI	• Create automated databases of STI so that NATO staff members can access the collection from their individual workstations • Provide multiple access points to STI (e.g., multiple subject terms, authors, originating organizations) • Index STI documents individually, including significant attachments to other documents • Establish common cataloging rules and procedures for all NATO STI material	• Demand searching of NSTIS and other NATO STI databases • New NATO STI accessions listing	• Expend fewer manhours in identifying and retrieving NATO STI documents • Provide access to citations and, eventually, to full text by end users for wider STI dissemination
Provide access to external STI	• Access commercial STI databases and other databases that include news, political, economic, and military information • Coordinate access to NATO nation STI through national channels	• Demand searching of commercial and NATO nation databases • Document ordering • Identification of STI resources • Bibliographies on significant topics • State-of-the-art bibliographies	• Professional staff members are more likely to be aware of developments in their fields of expertise in non-NATO sectors • More comprehensive STI knowledge can be made available • The NATO staff will be able to consider methodologies used in the commercial and Governmental sectors • Reduce time spent in identifying optional study methodologies
Enhance NATO corporate memory and knowledge of STI	• Provide services and printed products that proactively disseminate knowledge about material in the databases • Provide document ordering services to acquire both NATO and external STI • Create a database of past and present NATO STI documents and R&D projects • Provide professional expertise to help staff members access both external and internal STI	• Demand searching of NSTIS, other NATO, commercial, and NATO nation databases • Document ordering • Identification of STI resources • Selective dissemination of information • Directories and lists of people in science and technology	• Provide new NATO staff members with an information base • Contribute to project continuity and understanding across NATO agency boundaries • Provide professional expertise to assist the staff in accessing both external and internal STI • A base of more complete information leads to better decisions

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TABLE 2-1

HOW NSTIS OBJECTIVES MEET USER REQUIREMENTS WITH PROPOSED SERVICES AND PRODUCTS AND IMPROVE DISSEMINATION OF STI (Continued)

NSTIS objective	To meet user requirement	With proposed NSTIS service, product, or both	To improve STI dissemination
Improve coordination of STI activities to reduce the chance of duplicating scientific research	• Create a database of past and present NATO and joint-national R&D or armaments development projects	• Demand searching of the NSTIS RIP database • Symposia on selected topics • List of new NATO RIP projects • State-of-the-art bibliographies	• Reduce expenditures for duplicative R&D efforts and become better able to identify areas that require greater R&D resources • Provide a better foundation for project initiation by knowing what projects and documents have gone before
Improve coordination of NATO military needs with armaments development and R&D efforts	• Coordinate information regarding military needs with R&D and armaments development • Gain access to information regarding the capabilities of Warsaw Pact weapons systems	• Demand searching of the NSTIS RIP database • Coordination of NATO military needs with R&D efforts • Bibliographies on significant topics • Access to a threat database	• Improve the correlation of NATO Military Commands Long Term Planning Areas with R&D efforts • Improve the linkage between Conceptual Military Framework documents and R&D efforts
Assist in the development of NATO information management policy	• Reduce redundant processing of STI in NATO • Coordinate separate but similar document processing efforts (e g , registries, NSIB, and office automation) • Exploit new technologies for processing STI	• Symposia on selected topics • NSTIS performance studies	• Reduce redundancy in information processing • Assist with NATO systems planning concerned with future technologies • Promote integration and cooperation in system planning within NATO
Improve cooperation among member nations in the exchange of STI	• Reduce redundant R&D among the NATO nations • Improve the quality of R&D by sharing talent and expertise • Improve both R&D and the operational efficiency of armaments through greater standardization of R&D practices and the weapons themselves	• Demand searching of NSTIS databases • Document ordering • Symposia on selected topics • Directories and lists of people in science and technology	• Reduce expenditures nationally on redundant R&D • Improve the quality of R&D efforts by sharing talent and expertise • Improve standards for STI management and dissemination throughout NATO

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received and processed through a registry. Within this total population of documents that come into NATO Headquarters are some that qualify for the NSTIS or NSIB databases. Documents will be recorded in the online registry databases now being established by the SITCEN.

When the full text of documents created in machine-readable form by the PCs and CPT word processing machines becomes more greatly available, the SITCEN is planning to introduce this full text into the registry databases. Ultimately, full text will supplement any citation records that the registries are creating for processed documents. During system design and development, the potential availability of the full text of STI documents should be examined for a possible interface to the NSTIS.

2.5.2 Handling of Similar Core Records

The registries, the NSIB, and the NSTIS will process similar information about a document. Each database will contain information about, for example, the date of publication, the NATO reference number, the title, and the author(s). Registry automation plans call for their staffs to create a bibliographic record for each document received. Whether the NSTIS can use these data as captured by a registry for the core NSTIS Citation database record will have to be reviewed during the system design and development phase. If such data are useful and available to the NSTIS, planning for system interfaces will have to be done accordingly.

2.5.3 Common Requirements for Document Analysis

For facilitated retrieval, the registries, the NSIB, and the NSTIS all need subject classifications (or subject terms) about a document in their respective databases. Even when the full text of these documents becomes available, the NSIB, registries, and NSTIS will still wish to attach both core record fields and subject terms to full text database records.

The AC/315 NATO Standardisation Group and its Ad Hoc Working Group of national experts have been investigating the possibility of using a thesaurus (or controlled vocabulary) for classifying standardization documents. They have also begun investigating the advisability of reviewing candidate thesauri for use by the NSIB and possibly by other related NATO databases. Coordinating this effort should result in a subject classification standard for all NATO documents; the standard should simplify sharing of NATO information.

2.6 THE NSTIS IN THE FUTURE

The NSTIS must remain apprised of technological developments that affect future information systems and services. These developments should be incorporated into system planning and expansion at NATO Headquarters for implementation as the organization evolves and the technology becomes cost-effective. Listed below are two technologies illustrative of the many which the NSTIS may utilize some day.

2.6.1 Innovative Storage Technologies

Of available innovative technologies for information storage, retrieval, and distribution – compact disc read-only memory (CD-ROM), digital videodiscs, laser card, write-once discs – CD-ROM seems particularly attractive to the information database industry because it has the most flexible capabilities to store large textual files and graphic information. CD-ROM is a digitally-encoded, read-only optical medium that fits well with the read-only aspects of other publishing media and machine-readable databases. The following are examples of how the information industry is beginning to use this technology:

- McGraw-Hill of the United States recently announced the availability of its first direct CD-ROM product, the Science and Technology reference set. The disc, a combination of material from the *Concise Encyclopedia of Science and Technology* (CEST) and the *Dictionary of Scientific and Technical Terms – Third Edition* (DSTT), retails for US$300. CEST has 7,300 articles; DSTT has 98,500 terms and 115,000 definitions. The disc also includes illustrations from those publications.

- The British Library plans to computerize its general catalog by converting its 360-volume, 8-million-entry printed edition to an online catalog and ultimately to a CD-ROM or other optical storage medium. When conversion is completed in 1991, the catalog will be among the largest single bibliographic databases in the world. The catalog will also be accessible online to the public.

No one knows the effect CD-ROM will have on the online industry. The NSTIS must consider the number of factors that this new technology will bring. For internal NATO needs, for example, the NSTIS (as well as the registries and NSIB) may wish to investigate use of CD-ROM as a replacement for microform and for storage of archival materials. These storage technologies also represent an opportunity to transfer data between NATO centers and NATO nation systems

without the risk and cost of telecommunications. The NSTIS must remain aware of developments in this technology as part of its program to conduct performance studies (see Subsection 2.4.2.10, "NSTIS Performance").

2.6.2 Full Text

Technology that permits cost-effective input, storage, and output of full text is rapidly coming into being. The introduction of full text to a database will entirely alter how an information resource is organized and used. The full-text database is much larger than one confined to citations and abstracts. Growth requires that the supporting system be capable of more precise searching commands and that the user be able to formulate more sophisticated retrieval strategies. Some vendors that have begun offering full-text databases have developed new search command strategies to expedite retrieval of documents. Such command strategies might include word frequency counts that assign *de facto* subject terms to a full-text document, highlight search terms in the full text for user document scanning, and report search terms, positions, and frequency counts in a document.

The availability of full text represents an opportunity to improve the distribution of information over the traditional reproduction technologies now in place at NATO. However, as the NSTIS considers use of full text, the implications of such enhancements must be carefully considered in light of the effects on the supporting hardware and software, on the ability to support searching by staff members and end users, and the appearance of future products of the NSTIS. Decisions will have to be made not only on how to augment the supporting hardware and software to accommodate the material, but also on how and where the full text of documents will be stored, how full-text files will be communicated to a user, and how full text will be produced (or printed) for the user.

2.6.3 Information Resource Management

> Information Resource Management (IRM) means the policy, action and/or procedure concerning information (both automated and non-automated) that management establishes to serve the overall current and future needs of the organization. IRM policy and procedures would

> address such areas as availability, timeliness, accuracy, integrity, privacy, security, auditability, ownership, use, and cost-effectiveness of information.[8]

The concept of IRM developed as organizations, particularly large and diverse ones like NATO, came to realize that information was a valuable corporate asset. Significant amounts of money were being spent in storing, maintaining, processing, and retrieving information and data, and if it was not handled in a consistent and structured manner, the money could be considered wasted. Far more important than the money spent on information processing was the realization that information was used to make important decisions. If the information was not accurate and timely, good decisions would be hard to make.

The critical nature of accurate and timely data is equally well known in the combat environment and has led to the development of the Command, Control, and Communications (C^3) Concept.

IRM in the context of NATO administration should be twofold. First is development of policies for standardization of NATO-generated information (STI and other areas) with regard to: format, generation, technology, identification, storage, distribution, and retrieval. Second is exploitation of information processing technology to the fullest extent possible. As the NATO/AGARD WG-01 report stated:

> The Service's placement in the organization structure should permit its eventual integration into an Information Resource Management System containing other components, such as publishing/distribution, registries, text processing, and messaging. (p. 20)

In addition, the following technical components must be considered: word processing-to-computer transfer of text and data, optical character recognition, full-text storage of large volumes of material, laser printer reproduction of text for distribution, and use of CD-ROM for distribution.

Development of a total IRM concept within NATO will require time, commitment, and the participation of many organizations. The NSTIS should be an integral part of such an effort.

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[8]U.S. DoD Directive 7740.1. *DoD Information Resources Management Program*. 20 Jun 1983. Encl. 2. p. 2-1.

2.7 ASSUMPTIONS AND CONSTRAINTS

This section of the report itemizes the assumptions made and technical constraints encountered in developing this FD of the NSTIS.

- STI is a part – not the whole – of NATO information policy and services.
- The NSTIS will be situated at NATO Headquarters.
- The NSTIS will not be responsible for physically storing STI, with the exception of a core reference collection.
- The NSTIS must provide all NATO with information products and services.
- The NSTIS must be able to interface with other NATO agencies and their STI resources.
- The NSTIS must serve the NATO nations.
- NSTIS products and services will be developed and introduced in phases.

SECTION 3

DESIGN DETAILS

In this section we describe in greater detail the input, processing, and output functions that were summarized in Section 2.4, "Proposed Methods and Procedures." The description of each function is amplified and described in terms of the steps required for the function to be performed. Optional approaches to the functions are also discussed. Appendix E shows database elements recommended for input to the various NSTIS databases, and Appendix I the suggested output formats for the NSTIS products and services.

An information resource, such as the NSTIS, provides products and services to meet both the information needs of its user population and the objectives established for the resource. The recommended NSTIS products and services will be produced from the contents of one or more of the NSTIS databases. The accuracy and completeness of the databases are directly derived from the soundness of the selection, acquisition, and analysis processes. We cannot emphasize too strongly the importance of establishing consistent procedures for entering data into well-designed databases, to produce well-received and relevant products and services.

3.1 SYSTEM DESCRIPTION

The NATO/AGARD WG-01 report developed an NSTIS conceptual model composed of primary input, processes, and outputs. A graphical representation of this model is shown in the previous section as Figure 2-1. Three functions defined by the NATO/AGARD WG-01 have been augmented in this FD. The three functions are input, processing, and maintenance (described in Section 3.2), basic output (described in Section 3.3 and Section 3.4), and enhanced output (described in Section 3.5 and Section 3.6). In Figure 3-1 we have presented the functional overview of the NSTIS as presented in this section.

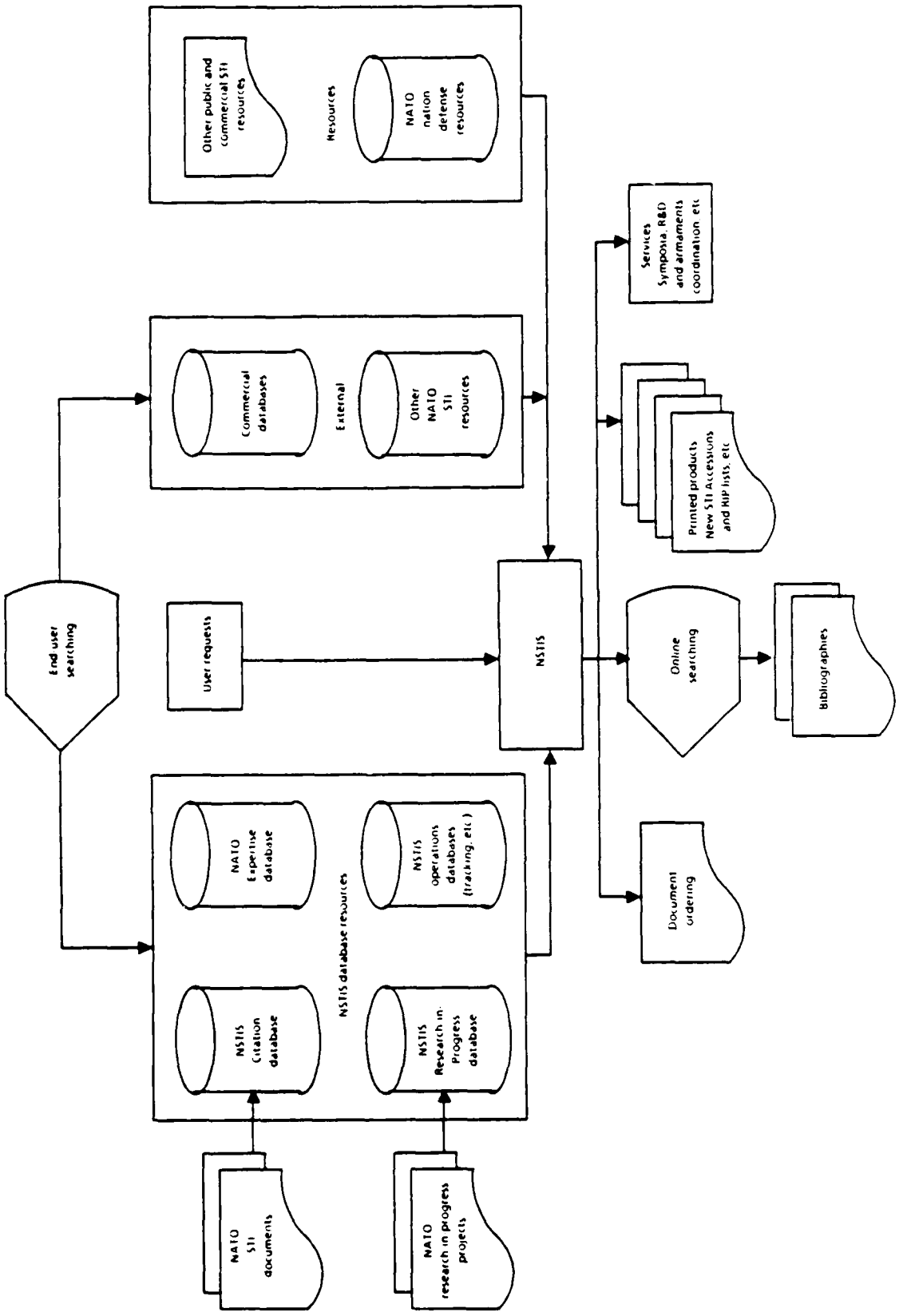

FIG. 3-1. NSTIS FUNCTIONAL OVERVIEW

3.1.1 Database Terminology Definitions

Several ADP terms used in this section of the report are defined below, with examples pertinent to the NSTIS.

- A *database* is a collection of related information, e.g., NATO STI or document order tracking information. A database makes it possible to process a group of data or information as an integrated whole. Therefore, instead of placing information about force readiness in separate physical files that are not logically connected – e.g., a file on WINTEX 1987 and another on Counter Air Operations, both of which contain documents on force readiness – the database can extract the information, irrespective of physical location, and then direct a user to the files where the information is to be found.

- A *record* provides database organization. A database is composed of a collection of records that have the same structure. For example, in the NSTIS Citation database, each record will be a reference to a single NATO document. For the NSTIS we have identified record structures for six databases.

- A record is a collection of related *fields*. A field contains a discrete piece of information, such as the name of an author or a NATO reference number. The fields and their formats (e.g., size) for the six NSTIS databases are listed in Appendix E.

- A *database management system (DBMS)* is software that serves as an interface between the user and the databases. There will be two types of users for the NSTIS databases. The systems analyst user type will, for example, define the database, establish record formats, and inaugurate the technical procedures for creating and maintaining the NSTIS databases. The other type of user will be an individual – either from the NSTIS staff or an end user, who requests that the DBMS retrieve records from a database.

3.1.2 Overall System Scope

The information products and services generated by the NSTIS will be supported by a system composed of hardware and software that provides database management, data entry, maintenance, retrieval, and output capabilities. The system must produce both preformatted and ad hoc reports, as well as such output as bibliographies and directories. The system must also support interfaces to other information systems and services, including commercial databases, NATO nation defense information resources, the STC, and SACLANTCEN. This NSTIS design

allows for additions to the system, as needed, to address any new interface requirements of the NSTIS.

The foundation for the NSTIS will be six databases of information for use in creating and supporting the production of information products and services to meet user requirements. These databases should be developed as needed to support the NSTIS products and services, which will be prioritized for implementation in the next phase. Table 3-1 is a list of these suggested databases and their contents, purpose, and users to be served by the output.

TABLE 3-1

PROPOSED NSTIS DATABASES

Name	Content	Purpose	Users served
Citation database	Records of STI documents that are either generated by or submitted to NATO Headquarters.	Support demand searching and such products as New NATO Accessions Lists, Selective Dissemination of Information (SDI) User Profiles,Bibliographies on Significant Topics, and State-of-the-Art Bibliographies	All user populations will be served by this database
Research-in-Progress (RIP) database	Records of planned, ongoing, and completed R&D projects sponsored, coordinated, and/or managed by NATO	Support demand searching and such products as New NATO RIP Projects Lists, coordination of NATO military needs with R&D efforts, and SDI User Profiles	All user populations will be served by this database
Document Ordering database	Records of document ordering activity and progress	Track document and material orders for the NATO staff	Primary users will be the NSTIS staff
Query Tracking database	Records of information requests posed to the NSTIS, their status, and progress	Track information requests posed to the NSTIS, their status, and progress	Primary users will be the NSTIS staff
Selective Dissemination of Information (SDI) User Profile database	Records of user information profiles reflecting continuing STI needs and interests	Establish interest profiles to be run regularly against the NSTIS Citation and RIP databases and distributed to users	All NATO staff and NATO nation individuals
NATO Staff in Science and Technology database	Records of the scientific and technical background and expertise of members of the NATO staff	For preparation of the enhanced information product: "Directories and Lists of People in Science and Technology"	All NATO staff and NATO nation individuals

3.1.3 System Hierarchy

The more detailed FDs in this section will be complemented by input-process-output charts. The figures in this section were prepared using the Hierarchy-Input-Process-Output (HIPO) design methodology. Appendix G contains a description of the HIPO methodology and symbols.

The HIPO charts are organized by a system hierarchy that reflects the composition of the system into functions, processes, and processing steps. The system hierarchy (Figure 3-2) serves as a visual table of contents for locating elements of the system design.

3.2 INPUT, PROCESSING, AND MAINTENANCE FUNCTIONS

This section describes the processes and activities needed to place information in the NSTIS databases. Functions to manage and maintain the databases are also covered. The NSTIS must establish sound databases in which well-defined input and maintenance functions can yield products and services of high caliber.

3.2.1 Acquire and Select NATO STI Documents

As described in Subsection 2.5.1, documents are created on a variety of machines and word processors at NATO Headquarters. A hardcopy of each of these documents, as well as documents that are submitted to Headquarters by other NATO entities and external groups, is submitted to a NATO registry for classification and storage. Within this total population of documents are materials that qualify as STI. The NSTIS will identify documents that qualify for the NSTIS database. These documents will then be reviewed using selection criteria established in NSTIS policy and procedures. Proposed selection criteria appear in Appendix F.

The ability of the registries to classify and handle all documents will be changing in the near future (see Subsection 2.2.3). During the NSTIS design and development phase, the effects of these technological and procedural changes on the NSTIS will have to be evaluated.

The NSTIS must establish working relations with the major STI generators within NATO Headquarters and in other NATO agencies, such as STC and

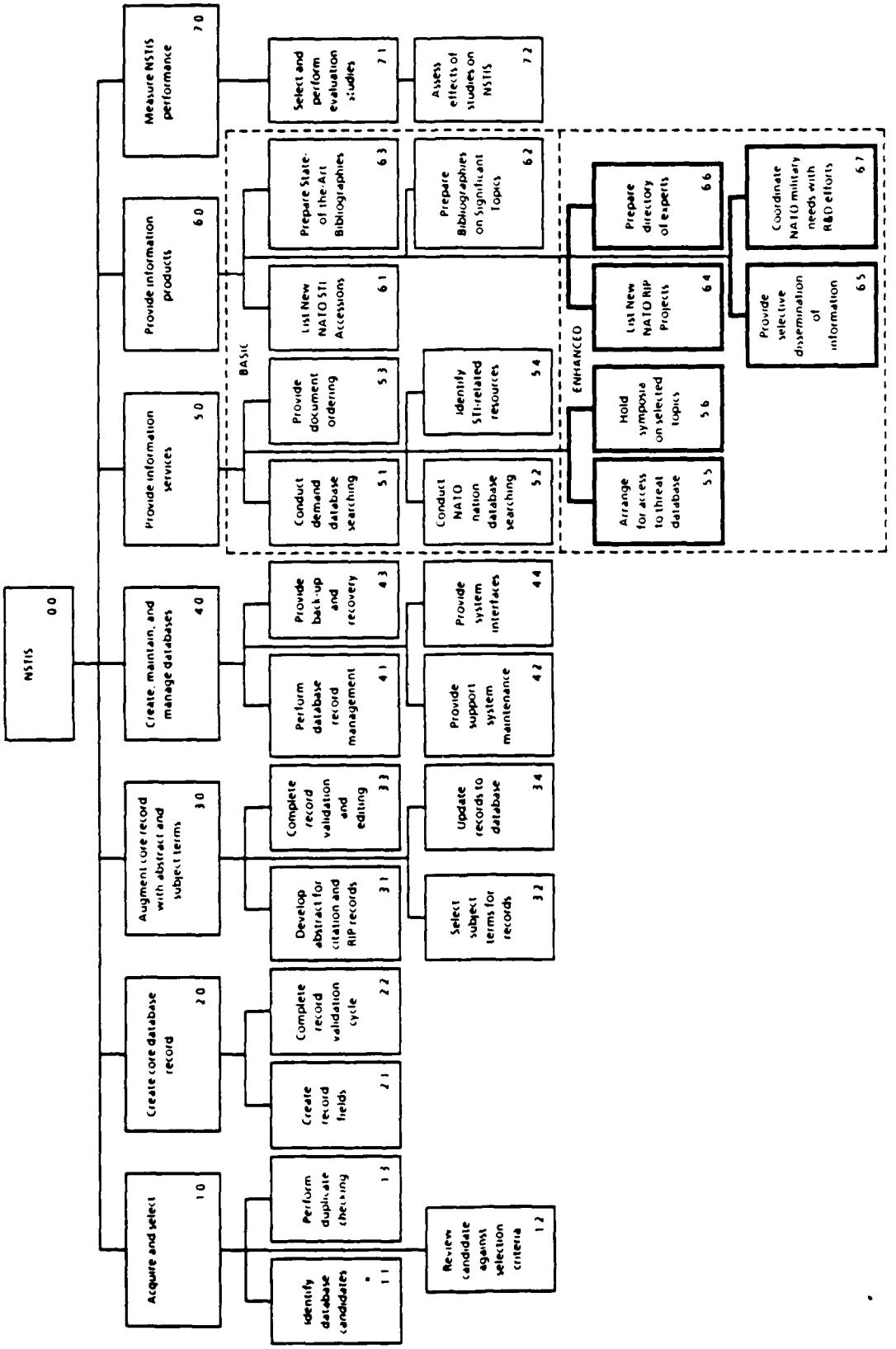

FIG. 3-2. NSTIS SYSTEM HIERARCHY

SACLANTCEN. The NSTIS can then become aware of all STI that may be candidates for the database or are available in other NATO information resources.

The primary selection and acquisition steps for documents that qualify as STI will be as follows:

- The document originator should identify NSTIS document candidates and forward the hardcopy, machine-readable record (or text), or both to the NSTIS.
- The NATO staff should submit document candidates to NSTIS.
- Review document against selection criteria.
- If the document does not qualify for NSTIS database, dispose of it in accordance with security regulations.
- Check a selected document to find out whether a record already exists in the NSTIS database.
- If a record of the document is in the database, check submitted material to see if it is an update or replacement.
- If the document is a duplicate, return it to the registry and/or dispose of it in accordance with security regulations.
- If the document qualifies as STI and is not a duplicate database record, create a core NSTIS database record (see Subsection 3.2.3).

This flow of activities is depicted in Figure 3-3.

3.2.2 Acquire and Select NATO Research-in-Progress Projects

No current procedures exist for acquiring background information on NATO RIP projects. Unlike documents, which are all channeled through the registry system, information on projects is not collected and maintained centrally anywhere at NATO Headquarters. Consequently, acquiring information on armaments development and RIP will depend more heavily on establishing working relationships with the NATO groups that monitor projects that may qualify for entry in the NSTIS RIP database.

The Defence Support Division, which coordinates more than 100 projects, is a prime example of a candidate for establishment of such a working relationship. The NSTIS will have to work closely with the NATO committees, panels, groups and

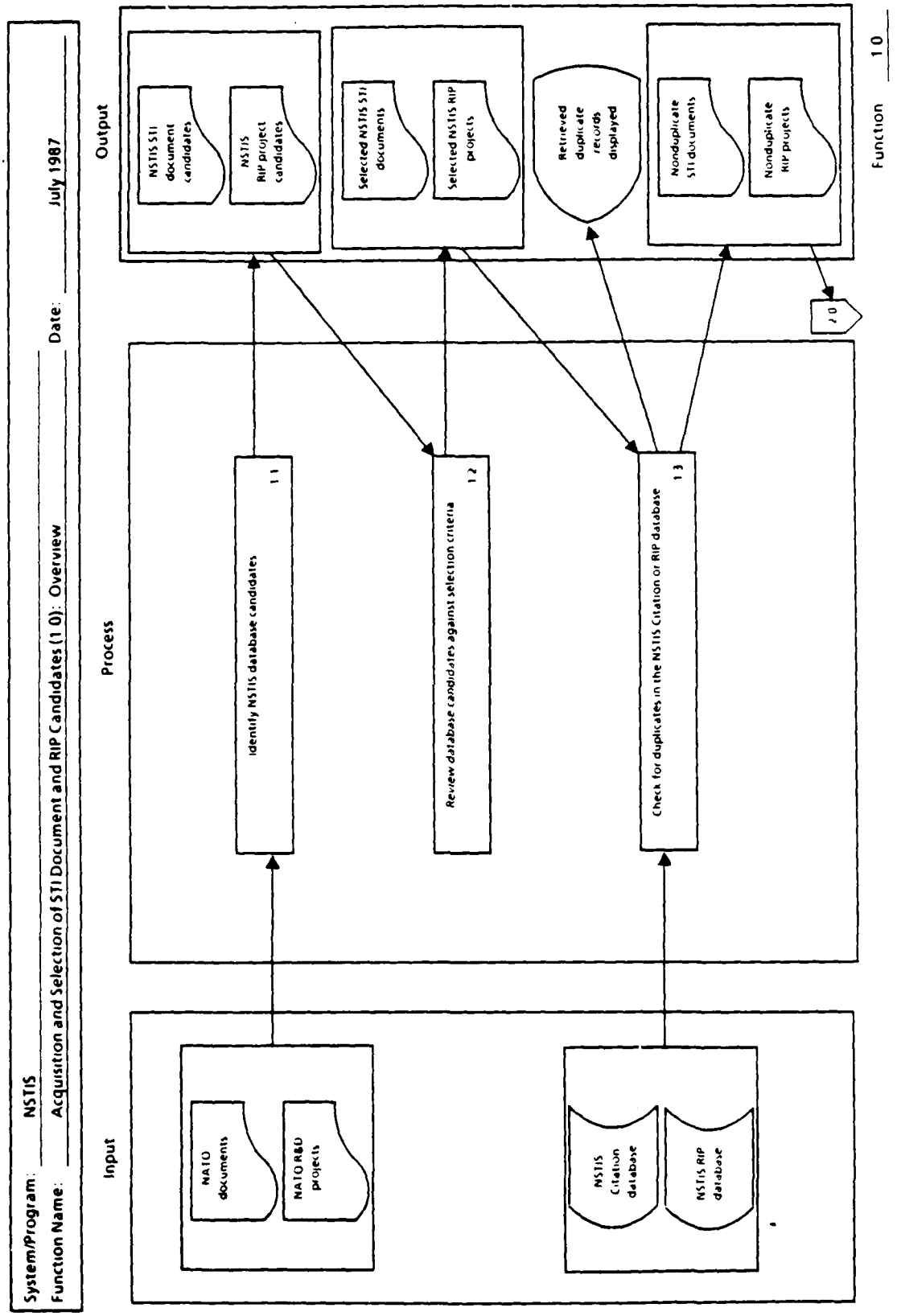

FIG. 3-3. ACQUISITION AND SELECTION

subgroups responsible for R&D projects and encourage them to submit data for entry into the database.

The need for project management data has become increasingly apparent to NATO Headquarters. Two groups in NATO Headquarters have begun automation efforts that will enable them to monitor the progress of the projects and grant awards for which they are responsible. These two groups are the SEAD and the Infrastructure Directorate. Both should be reviewed more closely during the system design and development phase for an understanding of applicability and possible transferability to the NSTIS RIP database.

The primary selection and acquisition steps for projects that qualify as RIP will be as follows:

- Receive project candidates from NATO agencies.
- Review project against selection criteria.
- If a project does not qualify for the RIP database, return the material to the submitting NATO agency or department and/or dispose of it in accordance with security requirements.
- Determine whether a record exists in the NSTIS RIP database.
- If a record of the project for the qualified projects exists in the database, check to see if it is an update or replacement.
- If the project is a duplicate, dispose of it in accordance with security requirements.
- If the project qualifies as RIP and is not a duplicate database record, create a core database record (see Subsection 3.2.3).

This flow of activities is also illustrated in Figure 3-3.

3.2.3 Create Core NSTIS Database Record

Once STI documents or RIP projects are selected for an NSTIS database, a record containing basic bibliographic citation or project identification data will be created. Fields for these data – author, title, NATO reference number, principal investigator, date project began, etc. – constitute the core database record. Some fields in the core record – e.g., main title and subtitle – will be in both English and

French. During the system design and development phase, NATO will decide who will create the core records for the NSTIS databases.

There are several ways to create core records. One is to enter the data online from a copy of the STI document or other available material (Figure 3-4 shows a possible layout of such an online input screen for keying an NSTIS SDI User Profile database record.) The NSTIS DBMS should then provide online validation checking, enhancement, and subsequent entry (or loading) of these core records to the NSTIS database. Alternatively, the core record may be first recorded on a standard form (such as the U.S. DoD Form 1473 used by DTIC) and then entered by the clerical staff, followed by validation checking, enhancement, and final entry to the NSTIS database. A third alternative is to use an OCR to enter data from a standard form into the database.

We recommend online record creation and input for the following reasons:

- An additional (and potentially error-producing) step of keying or scanning from a form is eliminated.
- The record can be entered, edited, and corrected in one step, shortening the time needed to enter the record into the database.
- If interaction with validation checking is available during online creation of the record, entry of the record into the database is further accelerated.

The main steps in creating a core record for the bibliographic citation and RIP projects databases are defined below. These two record types are the most important of the NSTIS databases.

- Enter data for all required (or mandatory) fields of a record. Required fields will be identified during system design.
- Enter data for supplementary (or "desirable") fields of a record. These fields are also to be identified during the next phase.
- Validate data on the basis of rules established during system design. Validation checking, a requirement of the selected system software, can look for such improperly entered numeric or date information as YYMMDD, in addition to misplaced data, e.g., numeric data in a textual field.
- Produce an error listing or an online message that reports all errors for each record located by the system validation programs.

NATO UNCLASSIFIED

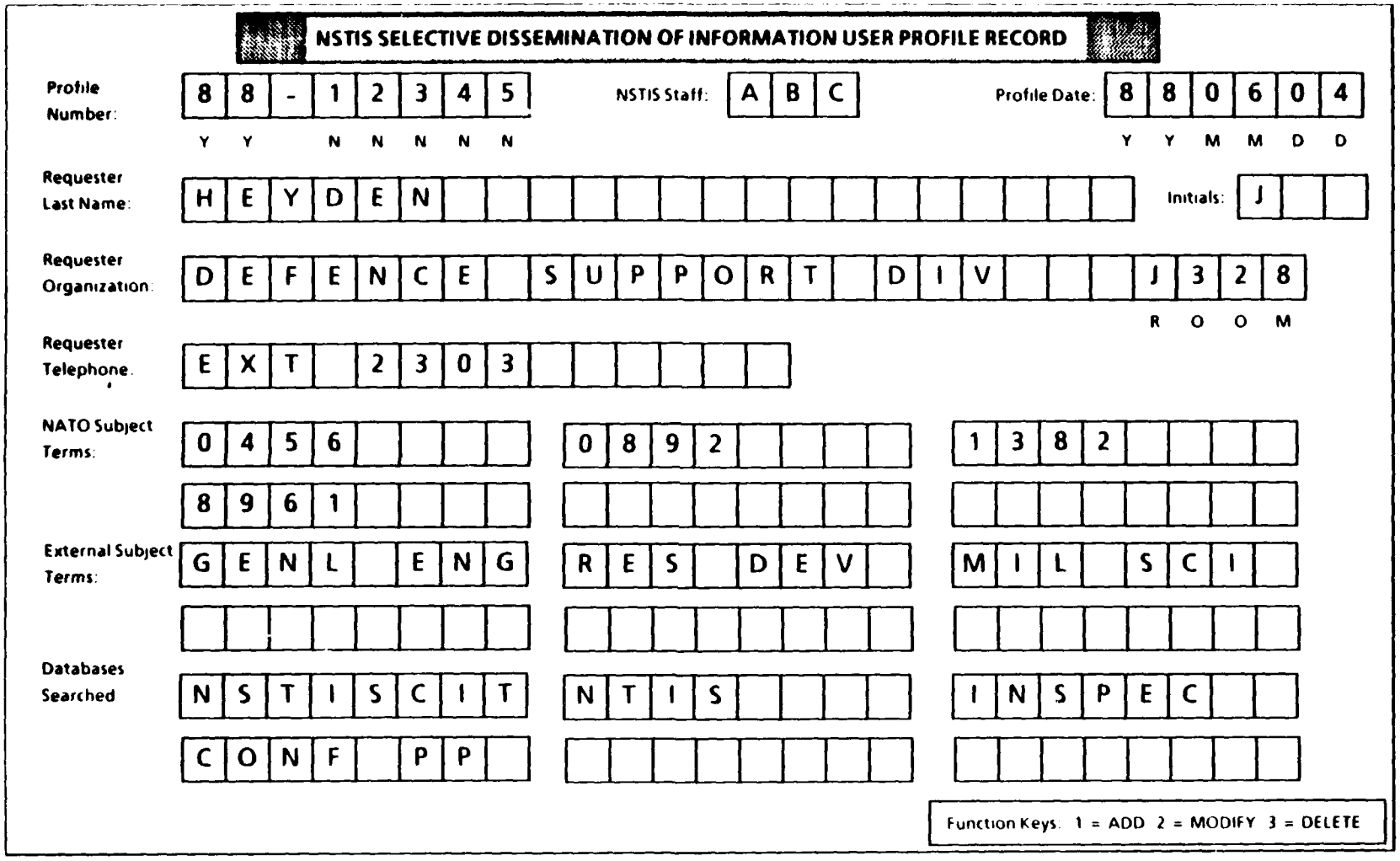

FIG. 3-4. SAMPLE LAYOUT OF AN ONLINE INPUT SCREEN

- Submit records that did not have any system-detected errors to a temporary file that is ready for the addition of abstracts and subject terms.
- Correct errors and resubmit the record to validation until it goes through validation without any errors being detected.
- Provide notification that core records have completed validation and are available for the addition of abstracts and subject terms. Notification can be in the form of a report generated either on a printer or in online mode.

This flow of activities is depicted in Figure 3-5. Entering records for the other NSTIS databases – Order Tracking, Query Tracking, SDI User Profiles, and Expertise Directory – will not require the same rigorous level of review and validation before entry to the database.

3.2.4 Augment Core Record Data With Abstract and Subject Terms

For both abstracts and subject terms, the text should appear in both English and French in the databases. During the next phase, how an interface will be constructed with the Translation Department to prepare any necessary translations must be defined. During the system design and development phase, NATO will decide who will select the subject terms, who will create the abstracts, who will enter the text for these fields, and how the information will be entered.

3.2.4.1 Abstracts

An abstract is a statement of the essential content of a document or project, or an indication of its characteristics. For scientific and technical reports and projects, abstracts should be approximately 250 words or longer and include the following: scope and objectives of the study or investigation, methodology employed, and conclusions and recommendations. Abstracts may be provided by the author, modified from a version prepared by the author, or created by NATO staff.

Depending on the decision made about the methods for treating classified documents and projects and their abstracts (see Subsection 4.3.1), the abstract of classified material may indicate that a document or project exists and convey enough information to help the user decide whether to request the full text or hardcopy.

3.2.4.2 Subject Terms

For consistency in the database records, subject terms must be selected from a controlled vocabulary. A thesaurus shows how these subject terms relate to each

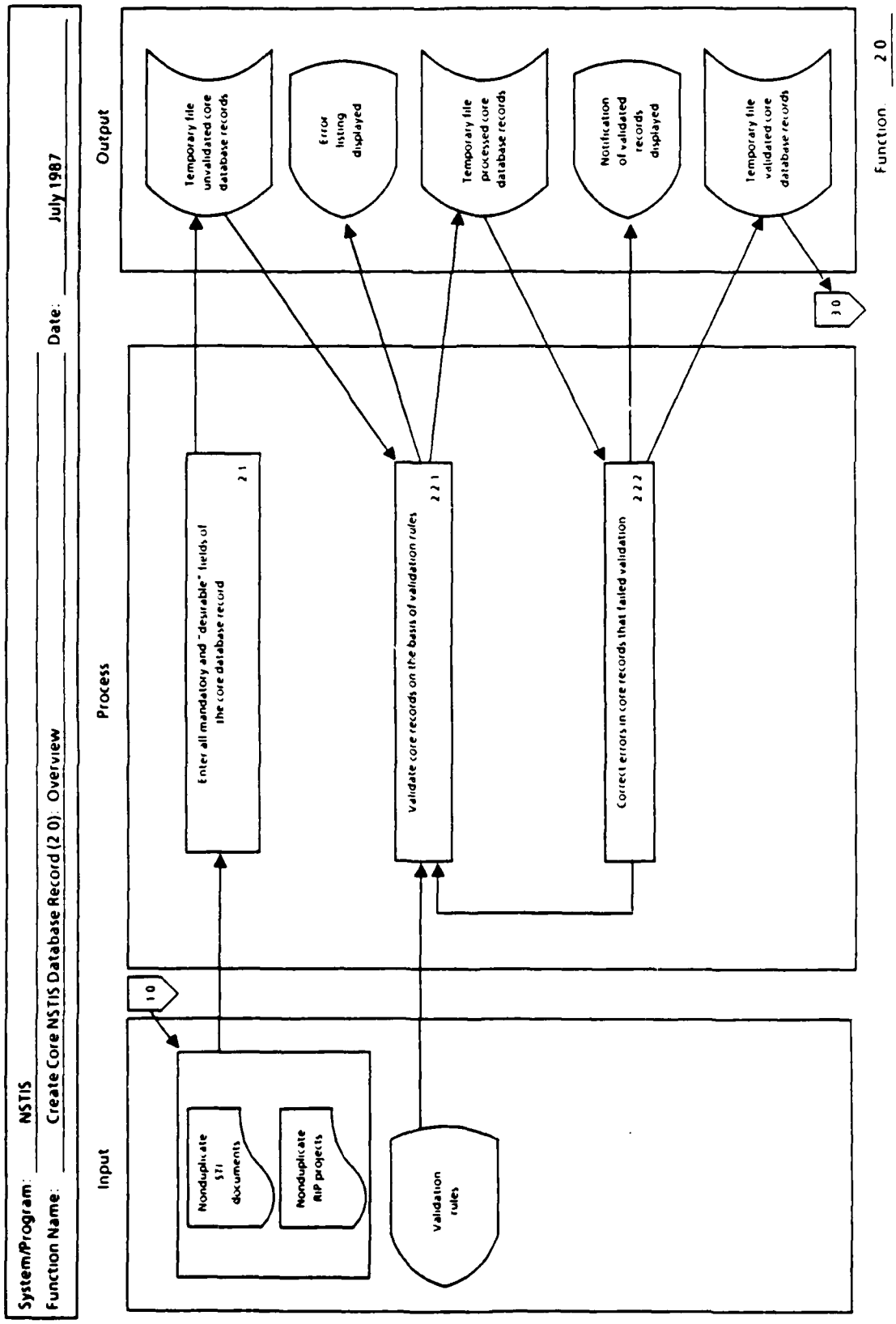

FIG. 3-5. CREATE CORE RECORD

other. The thesaurus structure enables users to more fully understand these concepts: the hierarchical relationships among subject terms and the more precise definitions of given subject terms, particularly among subject terms that have similar meanings.

We recommend that the NSTIS use a thesaurus and coordinate this requirement with the efforts now underway by the NATO Standardisation Program and the thesaurus consideration process by the AC/315 NSIB Ad Hoc Group of Experts on a NATO Thesaurus. Because of the significant cost of buying and maintaining a thesaurus capability, the NSTIS should not attempt this endeavor on its own. Combining the NSTIS thesaurus requirements with related NATO projects that have a need for a controlled vocabulary can distribute the costs and technical burden among several projects.

If the AC/315 NATO Standardisation Program chooses not to select a NATO-wide subject term thesaurus, the NSTIS will need an alternative form of controlled vocabulary, such as the one in Appendix H. We do not recommend use of author-provided subject terms because they will not be consistent. Only with consistency in subject terms provided by a centralized resource that assigns the subject terms to a record, can the NSTIS have the greatest confidence when searching the database using subject terms. This point is illustrated by the frequently inconsistent use of SIC codes by groups in the IMS as subject terms for documents .

Use of machine-aided indexing to identify subject terms is a future option. Machine-aided indexing can provide the "first pass" through the machine-readable contents of the record. This approach can be particularly effective if the machine-readable records are by-products of other operations (such as the office automation system now being implemented at NATO Headquarters). Machine-aided indexing selects candidate subject terms on the basis of statistical criteria or use of stored dictionaries. These subject terms can then be reviewed by a human indexer and accepted, rejected, or supplemented.

3.2.4.3 Text Searching

A supplemental way for the NSTIS to offer access to its databases is by free-text searching in the title, abstract, and other selected fields of the database record. This type of searching is also known as "natural language" searching, since retrieval queries are constructed with words and phrases from the original material. The

advantage of natural language retrieval is that it is usually understood by the individuals, particularly end users, who may be the searchers. Natural language terms are also more easily transferable across several databases. This capability can be explored and assessed by the NSTIS when the full text of documents becomes available.

3.2.4.4 Steps to Add Abstracts and Subject Terms to Core Records

Abstracts will be required for the Citation and RIP databases only. Subject terms will be selected and added to these two, as well as to the SDI User Profile and NATO Expertise databases. The primary steps to add abstracts and subject terms to core database records will be as follows:

- Review the abstract for possible adaptation and use, if the selected document contains an author-written abstract.
- Prepare an abstract according to the methods and procedures developed for the NSTIS during the system design and development phase, if the selected document has no author-written abstract. Who will prepare these original abstracts will be determined by NATO in the next phase.
- Select subject terms according to the methods and procedures developed for the NSTIS from a controlled vocabulary or thesaurus.
- Add subject terms to all database records except for the two operational databases – Document Ordering and Query Tracking. Add abstracts to Citation and RIP database records.
- Validate subject terms and abstracts by reviewing records, either online or from hardcopy reports.
- Start the database loading process, which includes indexing the records and adding them to the database The loading process for a large number of records is typically in batch mode; for single records, we recommend online record uploading.

This flow of activities is illustrated in Figure 3-6.

3.2.5 Create, Maintain, and Manage NSTIS Databases

The NSTIS must provide for management and support of the databases and must supply the interfaces they require.

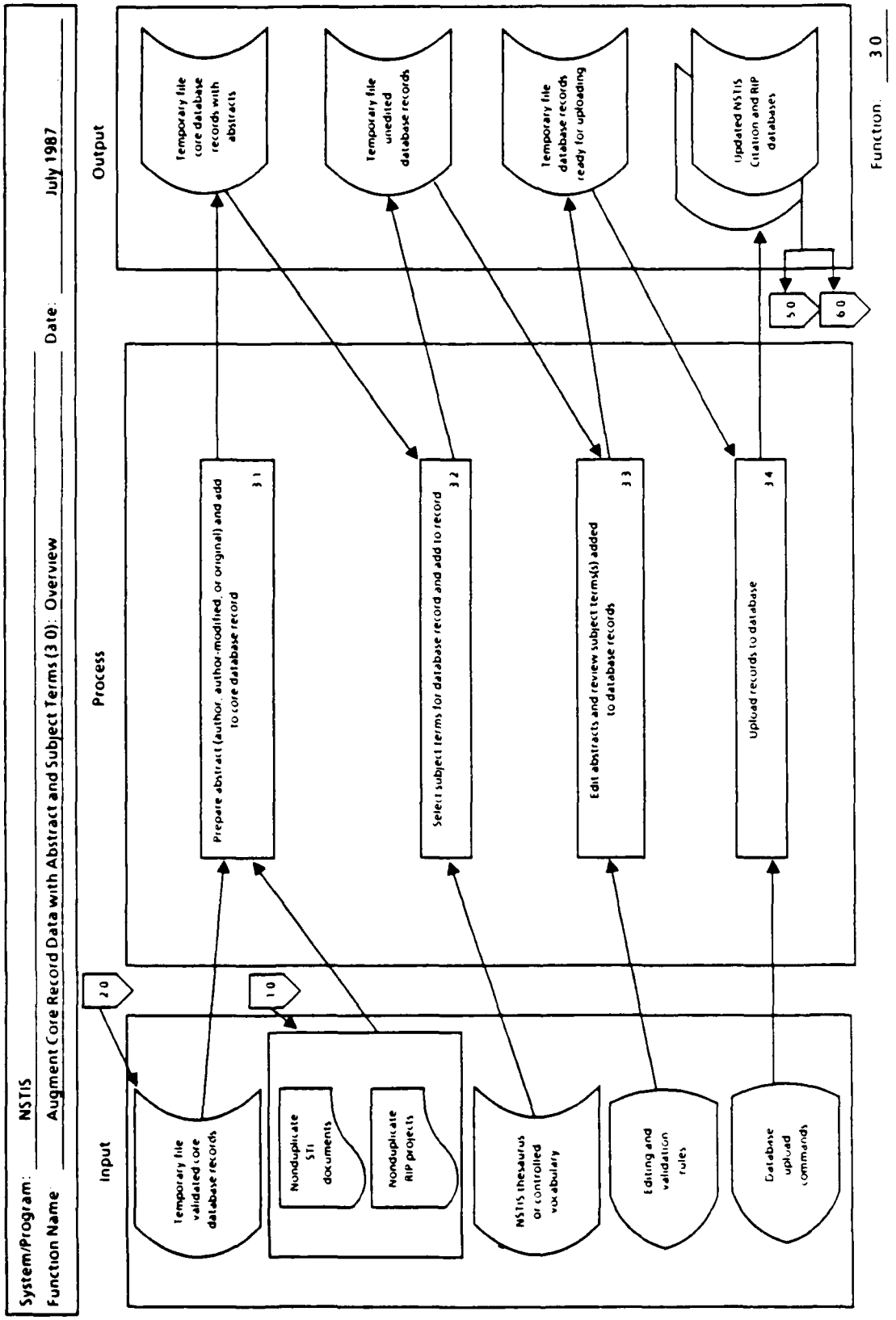

FIG. 3-6. AUGMENT CORE RECORD

3.2.5.1 Database Record Management

Procedures for modifying database records must be developed. As the requirements for serving NSTIS users change over time, methods of supplementing the existing database records will have to be defined. In some instances, it may be necessary to replace a record completely; the procedures for such replacement must be developed and approved. It may also become desirable to delete records from the databases that are no longer applicable to NATO. Finally, changes in the security classification of records will require modifications of the record.

3.2.5.2 NSTIS Support

The NSTIS hardware and software will require both maintenance and operations support. Maintenance consists mainly of monitoring system upgrades. Someone must monitor vendor contracts to make sure that upgrades are delivered when they are contractually due. Testing and acceptance of upgrades, once installed on the system, must be completed.

Institution of back-up procedures is imperative for proper operation of the NSTIS system. The data and applications software must be copied (or "backed up") once a day to a tape or disk that is then retained away from the computer facility. In some cases, back-up procedures may be warranted several times a day, and sometimes even continuously. A back-up copy of the data is an "insurance policy." If technical, electrical, or mechanical problems cause system failure, the data can be recovered from the back-up copy and restored to the system.

With the NSTIS, back-up and recovery capabilities may be provided as part of SITCEN operations if the shared resources configuration is selected. A stand-alone system will require NSTIS staff members to separately implement back-up and recovery procedures and perform them as part of their staff duties.

3.2.5.3 Interfaces

Purchasing and installing applications programs, such as the DBMS software, on a system does not mean the software is ready for immediate use. Systems analysts, often working with system programmers, must review and test the programs thoroughly as they are placed on the system. Then, based on an understanding of user requirements, the analyst must prepare an interface between the system and the end users. Such an interface may be composed of specially designed

menus, programming of function keys, and explanatory text to help a user. These interfaces must be updated over the years, as program upgrades and enhancements are added.

As with the interfaces between the system user and application programs, the NSTIS must be able to facilitate use of the system by external users. They must be guided to the database(s) for which they have security authorization. Access beyond their approved areas cannot be permitted; well-designed system security features can block such access. Users must also be able to conduct retrieval efficiently and have a reasonable understanding of the structure of the database(s).

3.3 BASIC NSTIS SERVICES

The main activities needed to provide the basic NSTIS services are discussed here.

3.3.1 Demand Searching of Databases

Demand searching of a database – whether supported by the NSTIS, a commercial vendor, or a NATO nation – typically results in hardcopy output, i.e., a printout of retrieved records. Output may also be captured in a file by a process known as "downloading." Once the records have been downloaded to a local file, the user can print a hardcopy output of the records or opt to retain the records in a personal database that can be established with a PC or other local computer resources.

A typical interactive information search session with a database – whether NSTIS, other NATO, or commercial – has the following steps:

- The user gains access to the system that supports the database with one or more passwords. The process is known as "logging on." The number of passwords is determined by the security levels available from the supporting hardware and software.
- At this stage, some systems ask the user whether he or she is a novice, casual user, or sophisticated searcher. The system adjusts its responses to the user's response. For a novice, the system will typically offer structured menus and helpful guidance on how to proceed through a search. More sophisticated users receive less of this structured help. A user should be able to request another level at any time during the searching process. For

example, a sophisticated user may not remember how to use a retrieval function that is not used often and may have to switch to the novice level.

- Since several databases are usually supported on one system, the user will next need to indicate which database is desired. Depending on the user's security authorization, which is directly correlated to the password(s) used to gain access to the system, the user may or may not be granted access.
- The user then begins searching. Typically, these searches comprise a series of statements that ask the system to look for records that contain certain items of information. This series of statements is called a "search strategy." The following could be a search strategy for the NSTIS Citation database:
  - Select records where the subject term from the controlled vocabulary is Naval Operations

    SUBJ = Naval Operations

  - And the record contains the words (CW) in its title (TI) or abstract (AB) "aircraft" adjacent (ADJ) to "carrier" or "carriers"

    AND TI OR AB CW aircraft ADJ carrier*

  - And the document type (DOC) is a report.

    AND DOC = rpt

For novice or casual users, all these terms are often spelled out in their entirety, and messages reporting on errors and suggestions are made for better search strategies.

- The system then reviews the selected database for records that match the search strategy. Once matching is completed, the user receives feedback on what the system has found in the database. For example:

  5 records were found

  If no matches are found, the user can change the search strategy to look for relevant database records.

- If records are found, the user can ask to review them. The records can be displayed on a workstation or PC screen, or the results can be printed out and delivered to the user.

This is a straightforward search session. The flow of activities is depicted in Figure 3-7. Many more commands and capabilities can be offered to a database searcher. The ones required for the NSTIS databases are itemized and discussed in Subsection 4.2.2, "Software Requirements."

3.3.1.1 User Access to the NSTIS Database

Several groups need access to the NSTIS Citation and RIP databases: the NSTIS staff, NATO Headquarters staff, other NATO agencies, and NATO nations. Among the NATO nations, DTIC has specifically expressed interest in access. In this subsection, we discuss the process of providing these user groups with access.

- NSTIS Staff. NSTIS staff members will be constant users of the databases to help them answer information requests from users. Because of the high level of interaction with the NSTIS databases, staff members will not need the prompting and "help" messages that other users will receive. Experienced people typically require methods that allow them to conduct a search quickly, with abbreviated direct commands that may be indecipherable to more casual users.

- NATO Headquarters Staff. An end user is defined as a professional with information needs who wishes to conduct his or her own retrieval from a database. Some of these end users will be Headquarters staff members who have a professional need for STI; for instance, engineers, project managers, technicians, and scientists. Other end users, such as registry staff members, have administrative needs. Even though end users may have in-depth training on how to use the retrieval commands that enables them to search databases for themselves, the system must treat them with more "forgiveness" and more instructions.

  Many telecommunications packages or networks provide an end user with a connection to a database. Recent years have seen the emergence of software that is specifically designed to support this task. These software packages have been called "gateways," "microcomputer interfaces," "front ends," and "intermediaries." They can help overcome the traditional barriers that end users have faced in doing their own searching. For end users of the NSTIS databases, an "interface" should be provided, in addition to the assistance that can be provided by the professional NSTIS staff members who act as intermediaries.

- Other NATO Resources and Agencies. Until completion of the system design and development phase, we cannot know how other NATO resources and agencies will gain access technically to the NSTIS databases. That decision will depend on the choices of hardware and software to support the NSTIS. Until there is direct access, the NSTIS will be able to respond to

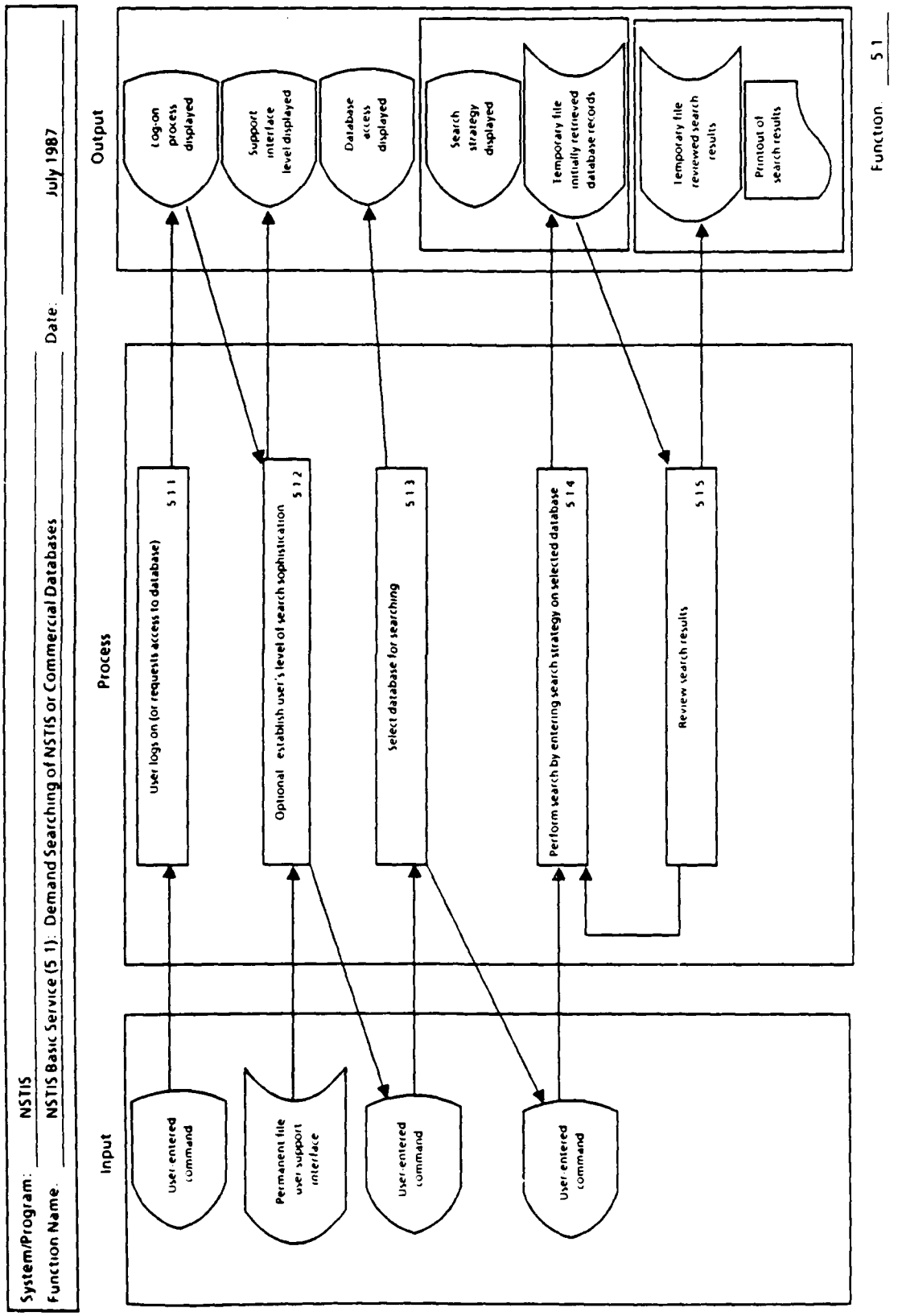

FIG. 3-7. NSTIS OR COMMERCIAL DATABASE DEMAND SEARCHING

queries posed by NATO non-Headquarters individuals who have communicated their STI needs by telephone or letter.

- NATO Nation Defense Information Resources. NSTIS will also answer queries from NATO nation defense information organizations, such as the U.S.' DTIC, Canada's Defence Scientific Information Service (DSIS), and The Netherlands' Scientific and Technical Documentation and Information Centre for the Royal Netherlands Armed Forces (TDCK). As noted by DTIC (Ref: IMSWM-DFG-135-86, 24 June 1986), assurances were requested that "the Department of Defense will have access to the bibliographic citations that will be resident in the established [NSTIS] database." NATO responded (Ref: IMSM-DFG-412-86, 13 October 1986) as follows:

  > ... With regard to your request ... for assurance that the US Department of Defense (DOD) will have access to the bibliographic citations that will be resident in the NSTIS data base, once established, the following is provided:
  >
  > You may be assured that the information contained in the NSTIS will be available to all nations in the NATO Alliance. The method of access to the information contained therein must be subject to some further study.

  Until the system to support the NSTIS has been selected, we cannot specify *how* NATO nation defense information resources, such as DTIC, DSIS, and TDCK, will gain access to the NSTIS Citation and RIP databases. Without question, however, they will be able to submit requests for information to the NSTIS.

3.3.1.2 Other NATO STI Resources

Nor, till telecommunications and system security capabilities are chosen for the NSTIS during system design and development, can the study team tell how the NSTIS will access other automated NATO STI resources. The NSTIS should have online interactive access to these resources, if permissible and practicable. But search requests may have to be submitted to, e.g., the STC and SACLANTCEN by telephone or correspondence. Then the staff members of these agencies will perform the actual searching and retrieval of information.

Future NSTIS planning may incorporate an exchange by machine-readable media of all or parts of the databases of other resources. CD-ROM technology may prove particularly useful in this respect.

3.3.1.3 Commercial Databases

During the system design and development, decisions will be made about the means by which the NSTIS will gain access to commercial databases, which commercial databases will be chosen first for access, who will do the searching, and how accounts will be established to pay for the associated charges.

One way to facilitate access to commercial databases for both NSTIS staff (who will remain available to conduct searches on behalf of NATO's scientists, engineers, and managers) and those NATO end users who may prefer to search on their own is the use of "gateway" or "front-end" software (see Subsection 3.3.1.1). Such software is available to reside on a PC for users who will access the gateway by telecommunications from a PC, or on a mini or mainframe computer with software available from either time-sharing vendors or commercial database vendors. This gateway software can provide the following capabilities:

- A user enters a search strategy.
- The gateway software decides which database(s) is (are) most likely to hold the information requested.
- The user's search query is translated into the search language of the selected database(s).
- The software accesses the selected database(s), transmits the translated information query, and retrieves the information.
- The retrieved information can, in many instances, be transmitted in machine-readable form to a local computer – for example a stand-alone NSTIS or cleared SITCEN computer – for storage and printout, further review, and continued sorting and annotation.

The practicality of using gateway software for accessing commercial databases will require further analysis and consideration during system design and development.

Standards will have to be established on how searchers, whether NSTIS staff members or end users, will receive training in how to search the commercial databases. The methods for addressing the problems that are often encountered in the selection of databases and formulation of search strategies will have to be taught. The hardest part of searching is devising an effective search strategy. Even with front-end or gateway software, the process still takes time and costs money and is affected by inexperienced searchers who are inefficient, thereby increasing online

searching costs. We recommend that until end users have completed some level of training, conducted by either the commercial database vendor or NSTIS staff members, access to these databases be only through the NSTIS staff.

Finally, until a choice is made – during the system design and development phase – of the computer resources to support the NSTIS, the technical means of accessing commercial databases cannot be determined. Several possible hardware configurations will be reviewed during system design and development. Each alters the manner in which telecommunications will support information interchange with resources external to NATO Headquarters.

3.3.1.4 NATO Nation Defense Information Services and Databases

Online access by the NSTIS to databases maintained by NATO nation defense organizations, such as DTIC, DSIS, and TDCK, is a desirable goal. However, much of the information in these databases is sensitive to the nation involved. Individual nations, fearing they lack enough control over secondary distribution, have reservations about releasing information about scientific and technological developments to the NATO community. Consequently, rigorous security authorizations may have to be instituted before the NSTIS can access these databases. Direct online access from the NSTIS system to any of these resources is unlikely until a closer relationship develops among the nations for joint R&D projects. Until then, these procedures should be followed:

- The NSTIS staff determines that information relevant to a user request may be available from a NATO nation defense database.
- On the basis of NSTIS policy and procedures, the request is communicated via a NATO nation point of contact at NATO Headquarters. The NSTIS may or may not be able to communicate with the NATO nation information resource to clarify the request.
- The point of contact reviews the scope of the request, the need to know, and the security clearance of the requester.
- The request is either forwarded to the NATO nation information organization or denied.

- The search results are returned to the nation's point of contact at NATO Headquarters, who reviews the contents of the results and either grants permission or denies release.
- If search results are released, they are forwarded to the NSTIS, the requester, or both.

This initial flow of activities is summarized in Figure 3-8; it may be changed during the system design and development phase. The study team expects such an arrangement to exist, at first, between the NSTIS and the NATO nation information resources.

3.3.2 Document Ordering

Users receive summaries of STI as a result of a database search. From these summaries of related materials, users can choose the items that interest them most. After reviewing a summary, a user may want the full text of the cited document. The NSTIS and similar databases, however, will not be able to supply it directly. Instead, the user, with the assistance of the NSTIS, will have to request it from whatever organization stores it.

For NATO-generated STI, users will request hardcopy from the registries. To assist with the arrangement, an NSTIS database record must include the registry system's NATO reference number. By including the reference number, when NATO-generated material is requested as the result of an NSTIS database search, the appropriate registry will be able to find the original document more easily.

The NSTIS will have to establish document ordering arrangements with the NATO nation defense information resources. For example, DTIC provides U.S. DoD users with requested documents. The NSTIS must register with DTIC so that cleared requests for copies of documents cited in the DTIC database can be met.

Copies of materials that are located by searches in commercial databases are typically obtained through contracts with organizations that specialize in such services. The NATO Library at Headquarters has established connections with libraries in Brussels, Belgium, such as the one at the American Embassy. The NSTIS should work with the NATO Library to determine whether requested material exists in the NATO Library collection, can be obtained through ILL from

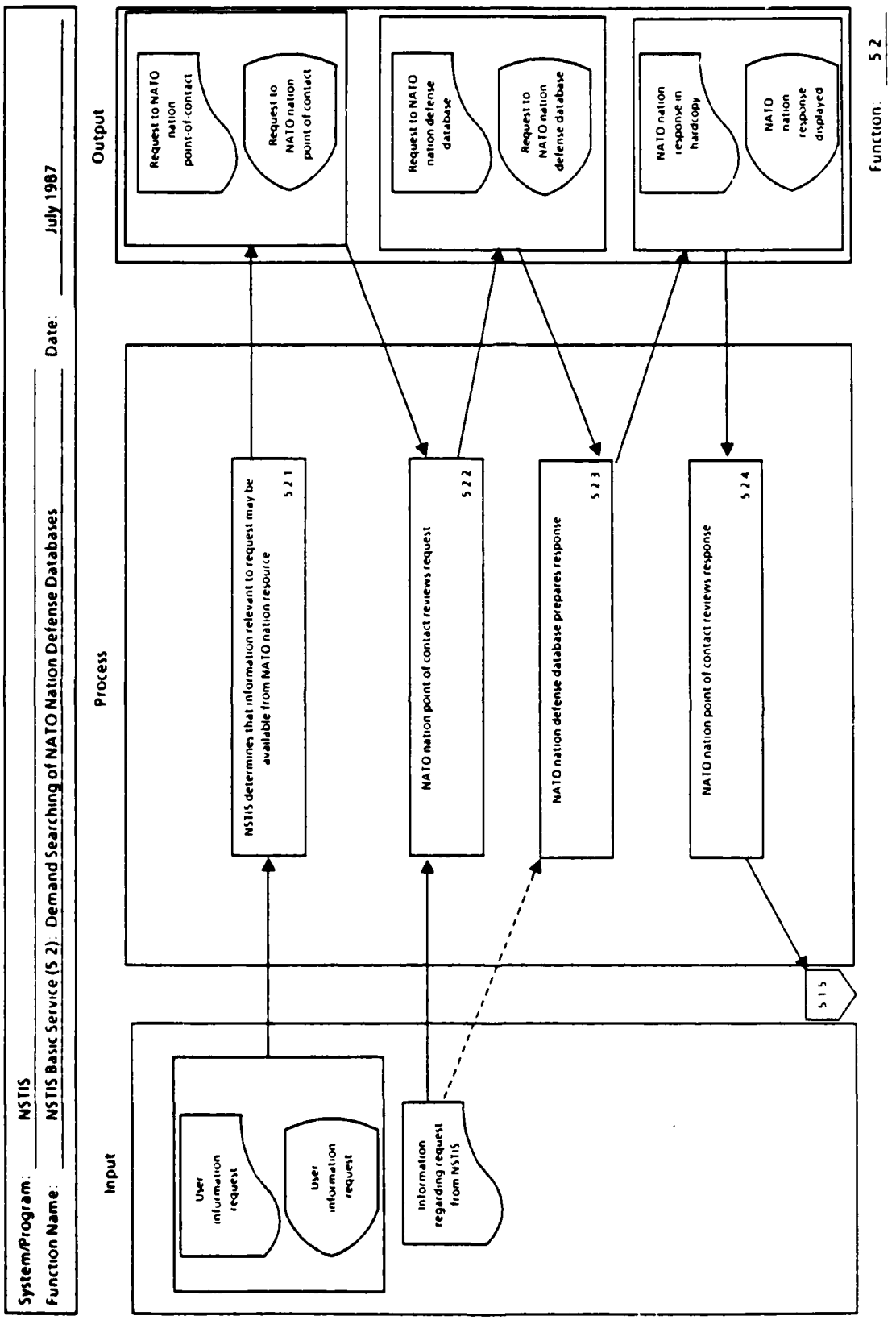

FIG. 3-8. DEMAND SEARCHING OF NATO NATION DEFENSE DATABASES

libraries in Brussels, Belgium or elsewhere, or must be forwarded to document ordering services, which charge a fee for the service.

The basic document ordering process will be as follows:

- The user contacts the NSTIS, indicates a need for hardcopy of document(s), specifying whether the material is to be "rushed." A sample document ordering form has been suggested in Appendix I as Figure I-1.
- The NSTIS checks for full bibliographic information before placing the order. For example, an ILL request requires a great deal of accuracy regarding author name, title, date of publication, etc., so that the receiving library can identify the requested material. If the user cannot provide the bibliographic information needed, the NSTIS must lend assistance in fully identifying the material on the user's behalf.
- The NSTIS places information about the request in the Document Ordering database.
- The NSTIS places the document order with the appropriate source and notifies the user of any charges or delays.
- The NSTIS, on a routine basis – for example once a week – generates a report of outstanding document orders that were placed more than 15 working days before and have not been received. Follow-up is conducted with document resources. This follow-up can be a letter that is automatically generated by a software associated with the Document Ordering database.
- The received documents are recorded in the Document Ordering database. Users are informed of the receipt of their orders, and arrangements are made for delivery.
- Follow-up is conducted with the user, to determine whether additional documents are needed or whether there were any problems with the received material.

This flow of activities is illustrated in Figure 3-9.

3.3.3 Identify STI-Related Resources

The NSTIS should be placed on the mailing lists of the professional societies and associations in the scientific and technical fields that are of potential interest to NATO staff. In addition to notices of conferences, such organizations often announce the publication of monographs, series, proceedings, and other materials that may be of interest to the NATO staff. Identifying organizations that have proved most

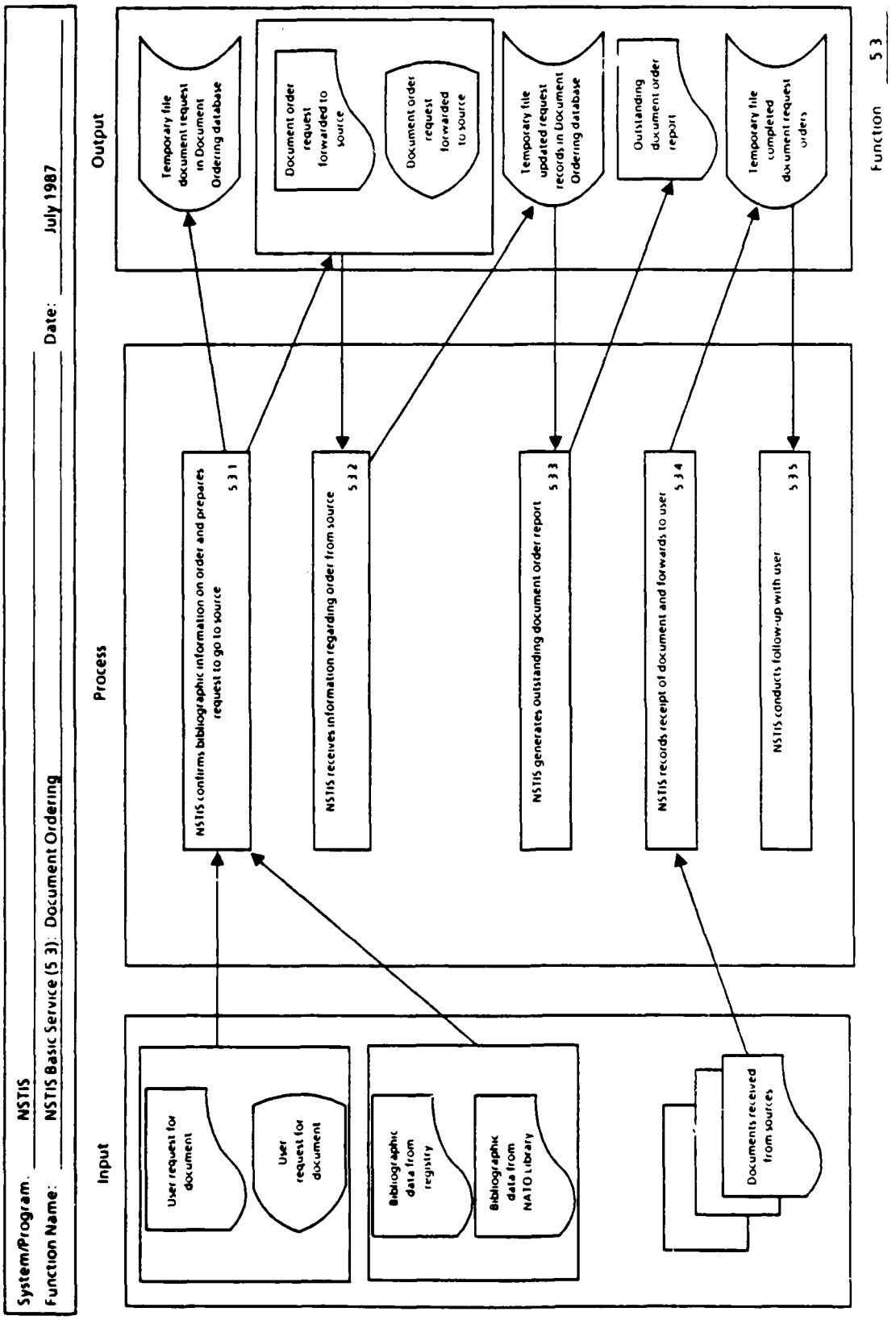

FIG. 3-9. DOCUMENT ORDERING

useful to the NATO staff may be accomplished by contacting NATO Directorates and Divisions.

The NSTIS staff should acquire core reference materials that will help them understand the information requests of the NATO staff. Such core materials are often produced by professional organizations. Two examples are *Van Nostrand's Scientific Encyclopedia* and *A Dictionary of Science & Technology*. These materials may also be of occasional use to members of the NATO staff. The NSTIS should announce their availability by circulating a list of reference materials on hand.

3.4 BASIC NSTIS PRODUCTS

Three NSTIS basic products are needed to address the STI requirements for the NATO staff: New NATO STI Accession Lists, Bibliographies on Significant Topics, and State-of-the-Art Bibliographies.

3.4.1 New NATO STI Accessions List

Once a quarter – possibly, once a month – the NSTIS will select all records that have been entered into the Citation database during the past quarter (or month). The retrieval results should be sorted in a manner that is useful to most individuals who receive a New NATO STI Accessions List, e.g., by major subject term categories and, within those categories, alphabetically by author's last name.

A New NATO STI Accessions List will be produced as follows:

- All Citation database records entered into the system since production of the last accessions list are retrieved and placed in a temporary working file.
- The retrieved records are reviewed for completeness of the record and checked for duplication with the preceding accessions list.
- The file is sorted into a predefined order, and headings, cover pages, etc. are added.
- The file is printed and duplicated in enough copies for distribution to the NATO staff. The NSTIS should investigate distribution of this list electronically to users who have access to visual display units (VDUs) or PCs on the NATO network.

This flow of activities is shown in Figure 3-10. A sample New NATO Accessions List is included in Appendix I as Figure I-2.

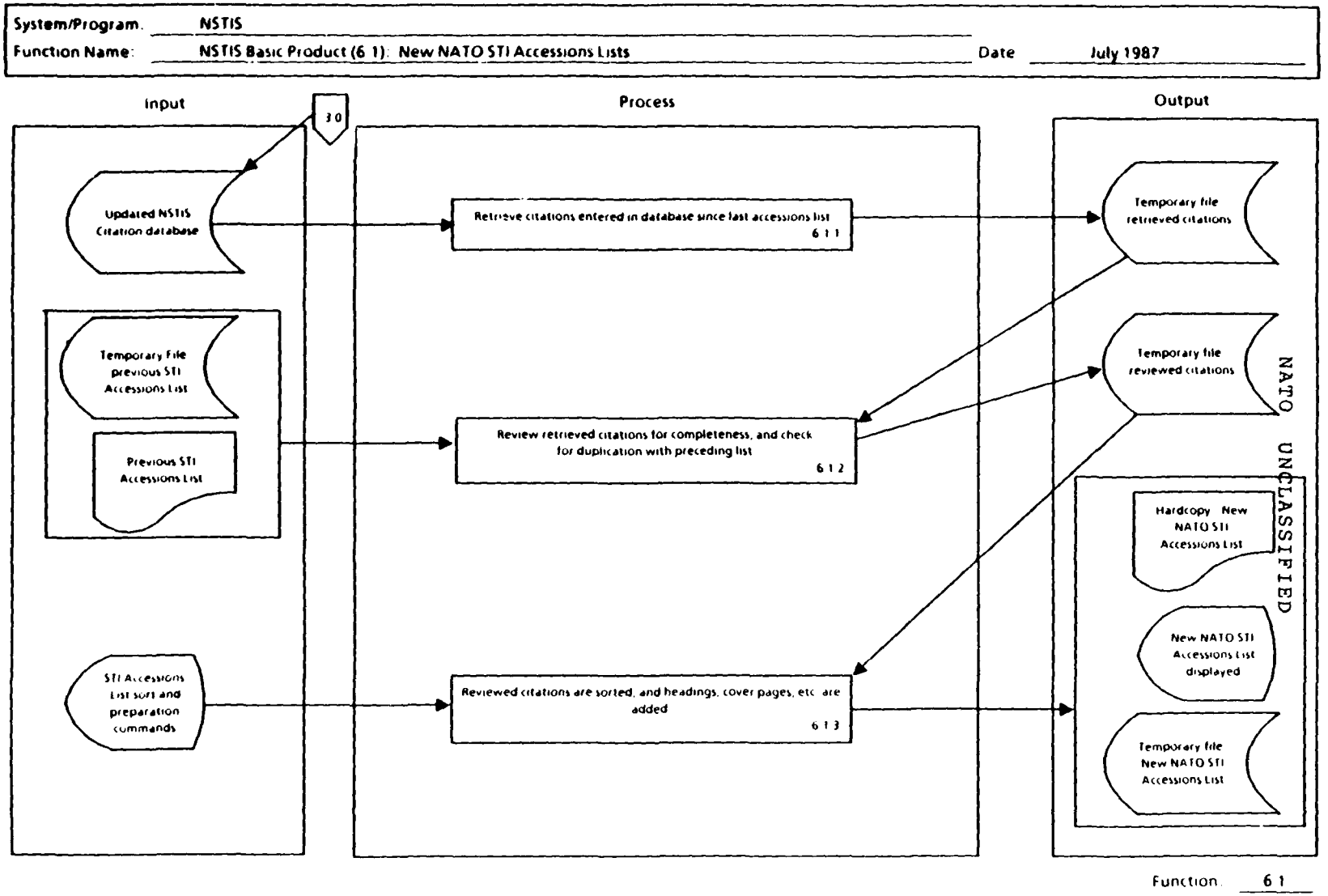

FIG. 3-10. NEW NATO STI ACCESSIONS LISTS

3.4.2 Bibliographies on Significant Topics

The NSTIS must be prepared to gather together information quickly from diverse resources in response to information needs on urgent topics. One way to do this is to produce a Bibliography on a Significant Topic, as follows:

- The NSTIS gains an appreciation for the scope and coverage of a potential topic by conducting staff interviews and reviewing the literature. Qualified NSTIS users may also contact the NSTIS and request compilation of a Bibliography on a Significant Topic.
- The NSTIS identifies available information resources – NSTIS databases, other NATO agency resources, NATO nation resources, and commercial databases.
- Searches are conducted through all available and relevant information resources. Activities are coordinated with the registries and the NATO Library.
- The bibliography is compiled and presented as a single document. The bibliography is organized in a fashion suitable for the user, e.g., in reverse chronological order, alphabetically by author's last name, by subject terms, etc., or by a combination of such sorting routines.
- The NSTIS offers the bibliography to NATO and NATO nation staffs when significant events occur in science or technology. Interested staff members may be identified by searching through the SDI User Profile database, as well as by knowledge acquired by the NSTIS staff in working with NATO and NATO nation staff.
- The NSTIS is prepared to obtain hardcopy and other follow-up information after the user(s) has (have) reviewed the bibliography.

This flow of activities is depicted in Figure 3-11. A sample of a Bibliography on a Significant Topic appears in Appendix I as Figure I-3.

3.4.3 State-of-the-Art Bibliographies

A state-of-the-art bibliography is a comprehensive bibliographic [illegible] on a selected topic, derived from all available resources. Additional [illegible] be provided, guiding the user to discussion areas and conflicting views [illegible]

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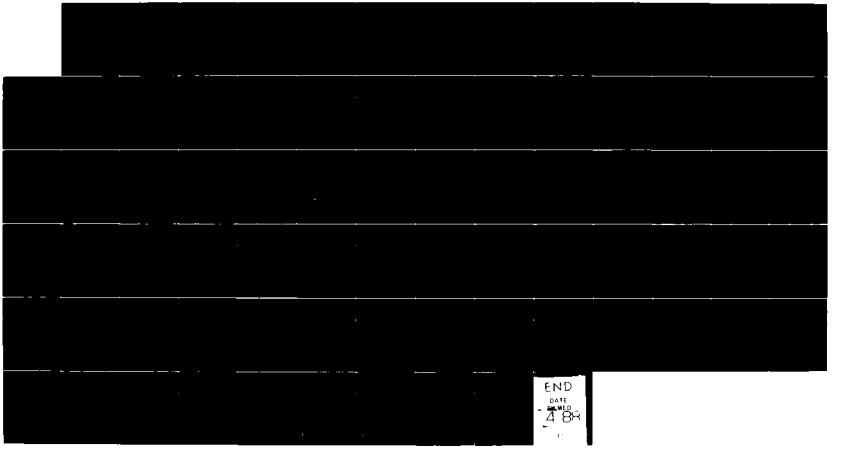

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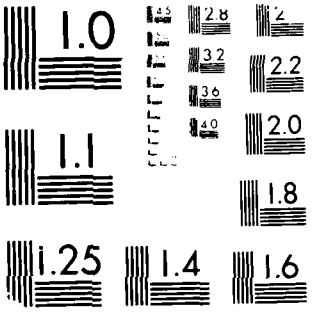


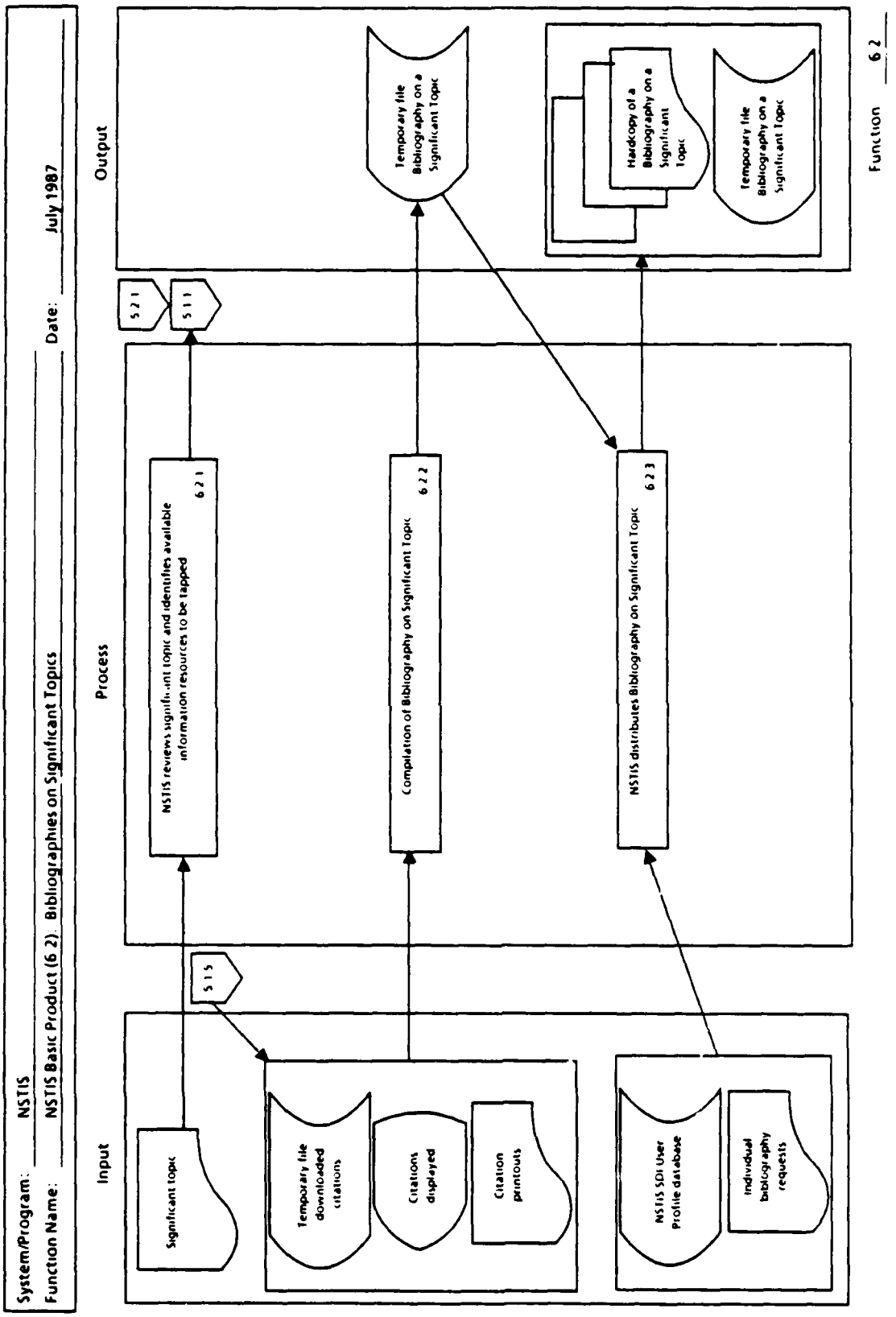


FIG. 3-11. BIBLIOGRAPHIES ON SIGNIFICANT TOPICS

The process of bringing together information and producing a State-of-the-Art Bibliography is as follows:

- The NSTIS staff identifies a topic that is of great relevance or benefit to a group of NATO users. Users may also nominate topics for production of a State-of-the-Art Bibliography.
- Available information resources – NSTIS databases, other NATO agency resources, NATO nation resources, and commercial databases – are identified.
- Searches are conducted in all available and relevant information resources. Activities are coordinated with the registries and the NATO Library.
- The bibliography is compiled and presented as a single document. The bibliography is organized in the most suitable fashion for the user, e.g., in reverse chronological order, alphabetically by author's last name, by subject terms, etc., or by a combination of such sorting routines.
- The NSTIS is prepared to obtain further hardcopy and other follow-up information after the user(s) has (have) reviewed the State-of-the-Art Bibliography.

This flow of activities is shown in Figure 3-12. A sample State-of-the-Art Bibliography appears in Appendix I as Figure I-4.

3.5 ENHANCED NSTIS SERVICES

The two enhanced services proposed – access to threat data and symposia on selected topics – are not defined well enough at this time for the study team to suggest procedures or format.

3.5.1 Access to a Threat Database

NATO management will have to explore ways of obtaining threat data for the Headquarters staff (particularly the armaments sections of the Defence Support Division and Infrastructure Directorate). This could include acquiring access to an existing database within one or more nations, or starting a joint project to access the raw data and build the database as a resource for sharing by NATO and the nations.

3.5.2 Symposia on Selected Topics

Only after the NSTIS has established itself and is providing adequate basic services can it begin to address some of the more global issues of STI processing

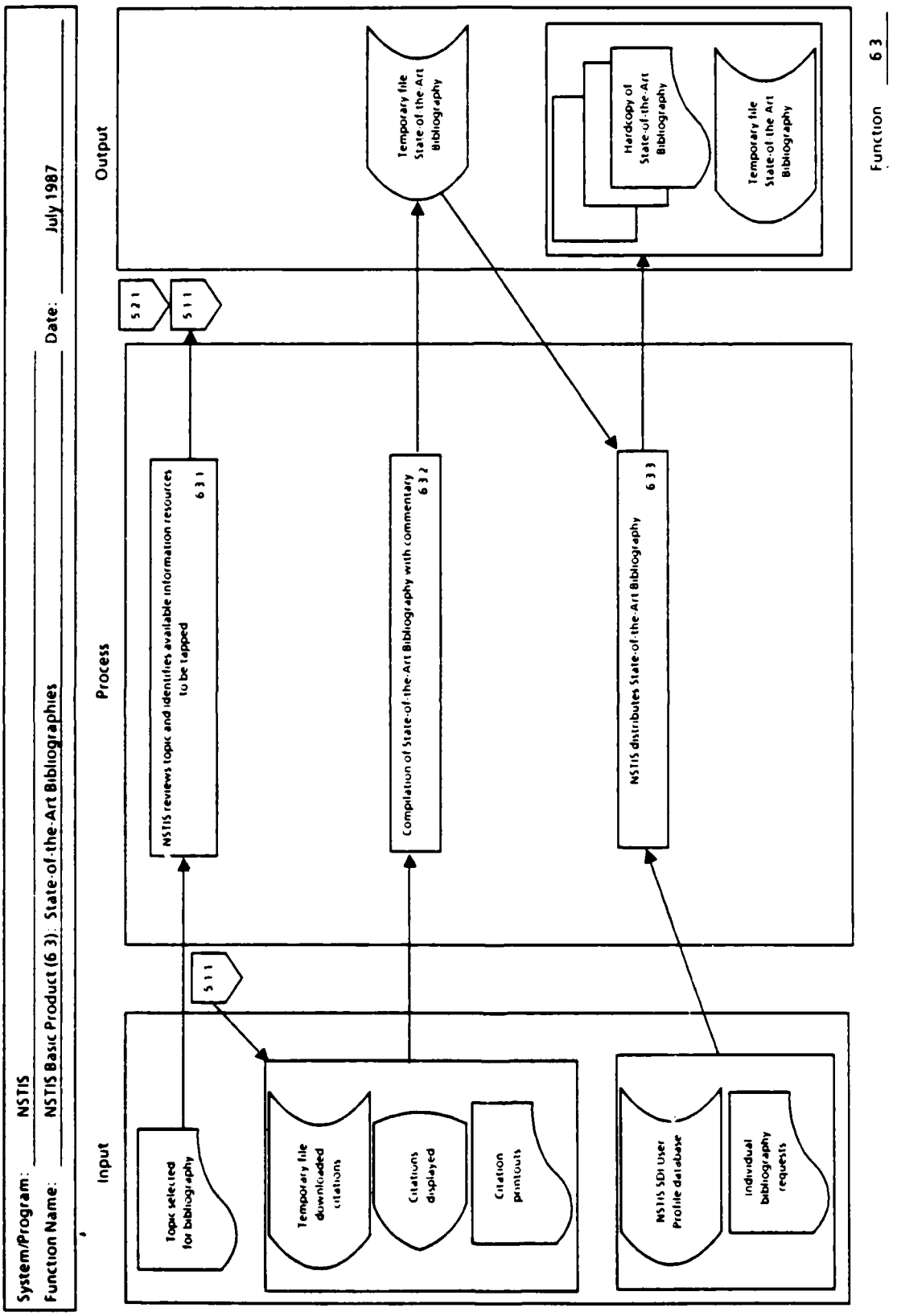


FIG. 3-12. STATE-OF-THE-ART BIBLIOGRAPHIES

within the NATO community. At present, we can only speculate about subjects that might be of enough interest to warrant organization of a symposium. Possible topics could include:

- Coordinating STI cataloging rules, processing methods, and ADP handling for various NATO STI centers and resources
- Performing overall policy coordination of NATO documentation procedures
- Evaluating the use of new technology in STI applications
- Developing and enhancing STI exchange among the nations.

As the forward movement of NATO IRM planning continues, these and other topics will become more evident.

In addition to organizing symposia on STI subjects, the NSTIS can provide other organizations with information to help them select and develop symposia topics. Assistance can include identifying areas of immediate interest for research or areas where R&D is lacking. The NSTIS can provide background reading for symposium organizers and perform other information-related services.

3.6 ENHANCED NSTIS PRODUCTS

Enhanced products will be phased into the NSTIS operations once basic products and services are established to meet critical STI needs: New RIP Project Lists, SDI User Profiles, Directories and Lists of People in Science and Technology, and coordination of NATO military needs with R&D efforts.

3.6.1 New NATO Research-in-Progress Projects List

On a quarterly – or possibly monthly – basis, the NSTIS will select all records that have been entered into the RIP database since the preceding selection. The retrieval results are then sorted in a manner that is useful to most individuals who receive the New NATO RIP Projects List, such as by major subject term categories and, within those categories, alphabetically by investigator's last name.

Production of a New NATO RIP Projects List will proceed as follows:

- All RIP database records that have been entered into the RIP database since the last project list was produced are retrieved and placed in a temporary working file.

- The NSTIS reviews the retrieved records. Review includes examining the record for completeness and checking for duplication with the previous list.
- The file is sorted into a predefined order. Needed headings, cover pages, etc. are added.
- The file is printed out and enough copies are prepared for distribution to the NATO staff. The NSTIS will investigate potential distribution of this list electronically to users who have access to VDUs or PCs when such capabilities become available.

This flow of activities is diagrammed in Figure 3-13. A sample of a New NATO RIP Projects List is provided in Appendix I as Figure I-5.

3.6.2 Selective Dissemination of Information Profiles

To become a "proactive" information service to NATO, the NSTIS must anticipate the STI needs of its users and forward relevant information without waiting for users to request it. One product that can establish this proactive approach is SDI. SDI is the inverse of database retrieval; here the users, rather than STI, are classified by subject terms. An SDI service is activated when new materials enter in the database. The NSTIS must decide how often to distribute the SDI User Profiles and how close a match there must be between subject terms recorded in a user profile and the database record for the information to be forwarded to a given user. Often, SDI User Profiles have "must" subject terms; i.e., if a database record includes a specified term, the user must be informed. The NSTIS must work with each user to fine tune the profile to achieve a proper balance so that the profile is neither too general (which can drown the user in irrelevant information) nor too specific (so narrow in scope that useful information is eliminated). Finally, as part of the Document Ordering service, the NSTIS must be able to provide a hardcopy of the STI document after the user has reviewed the SDI User Profile.

Output resulting from an SDI User Profile will be produced as follows:

- Interested users register an information interest profile with the NSTIS. The contents of these profiles (defined in Appendix E) will be recorded in an NSTIS database. An SDI User Profile enables a user to indicate subject terms of greatest interest. To insure consistency and thoroughness when the profile is matched with a database, the same subject terms and controlled vocabulary or thesaurus used in the NSTIS Citation and RIP databases must be used to classify the user profiles.

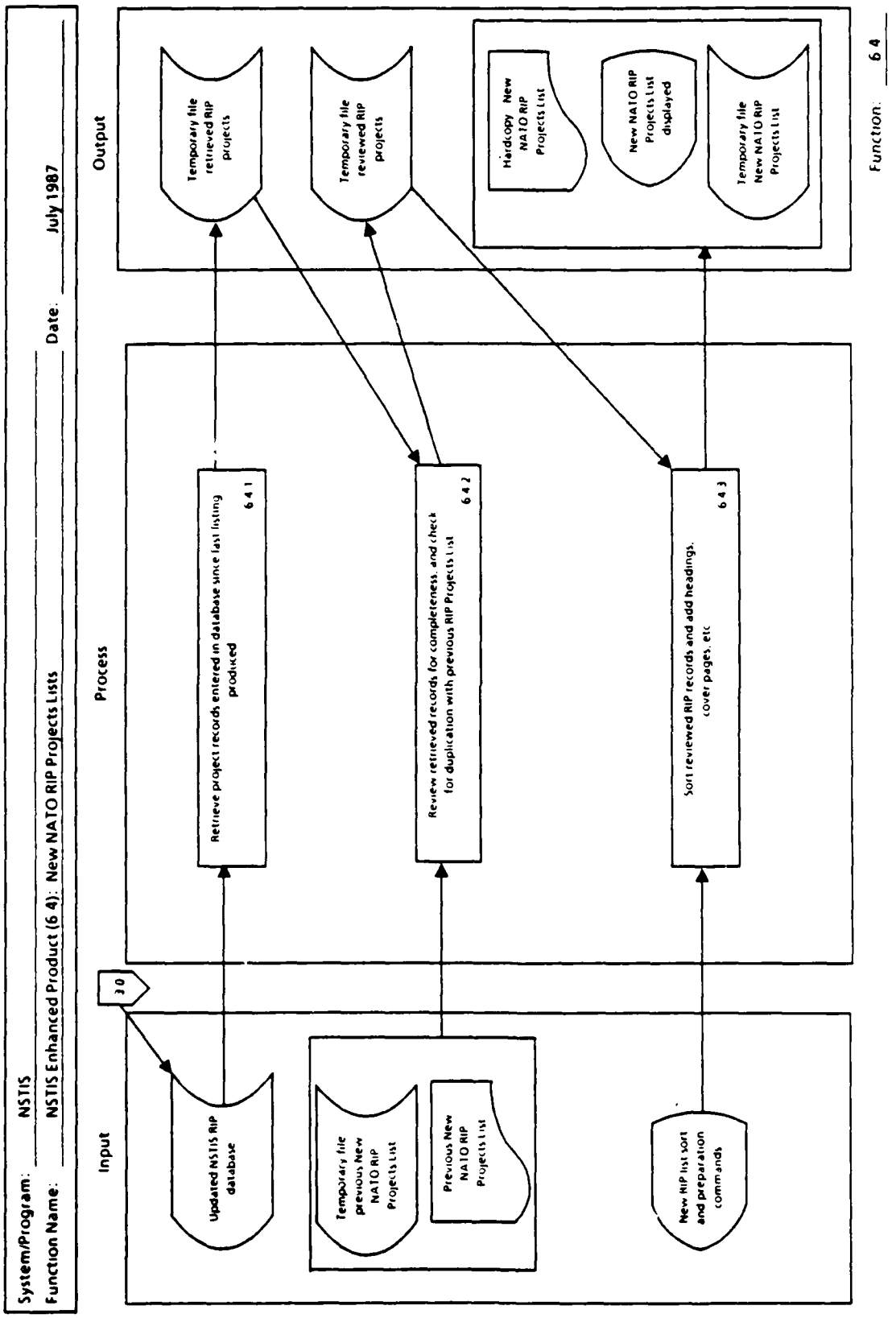


FIG. 3-13. NEW NATO RESEARCH-IN-PROGRESS (RIP) PROJECTS LISTS

- The SDI User Profiles are then compared with database records of newly acquired STI. This comparison is accomplished by matching subject term classifications. The NSTIS will need to decide what is an acceptable match.
- The user is then notified which of the recent Citation or RIP database records match his or her profile.
- After the user has reviewed the profile, he or she can request hardcopy (or full text) of the documents as part of the NSTIS Document Ordering service.
- The SDI User Profile must also include feedback mechanisms, so that the user can notify the NSTIS that records are either: not relevant, relevant but not needed, or relevant. On the basis of the feedback, the NSTIS staff can refine the SDI User Profile to continue to meet the user's SDI requirements.

This flow of activities is demonstrated in Figure 3-14. Appendix I includes a sample of output from an SDI User Profile as Figure I-6.

3.6.3 Directories and Lists of People in Science and Technology

To enhance knowledge of STI in NATO, an online database should be created to serve as a directory to NATO staff members and their areas of scientific and technical expertise. This directory, for which the database elements are defined in Appendix C, will enable both NSTIS staff members and NATO end users to locate individuals who may be able to provide professional guidance on a given subject. Areas of expertise should be indexed with the same thesaurus or controlled vocabulary as is used for the other NSTIS databases.

3.6.4 Coordination of NATO Military Needs With R&D Efforts

Coordination of NATO military needs with armaments development and R&D projects is of concern to many including the Armaments and Standardization Division, the Defence Support Division, the major NATO commands, and, of course, the nations themselves. The NSTIS can assist these organizations with specific products that address these issues. These products will link military requirements documentation with R&D and project documentation. Creation of this product would include these steps:

- Apply the same subject terms to military planning and requirements documents – such as the *Conceptual Military Framework and Long Term Planning* – as are used in the NSTIS databases. The subject terms should

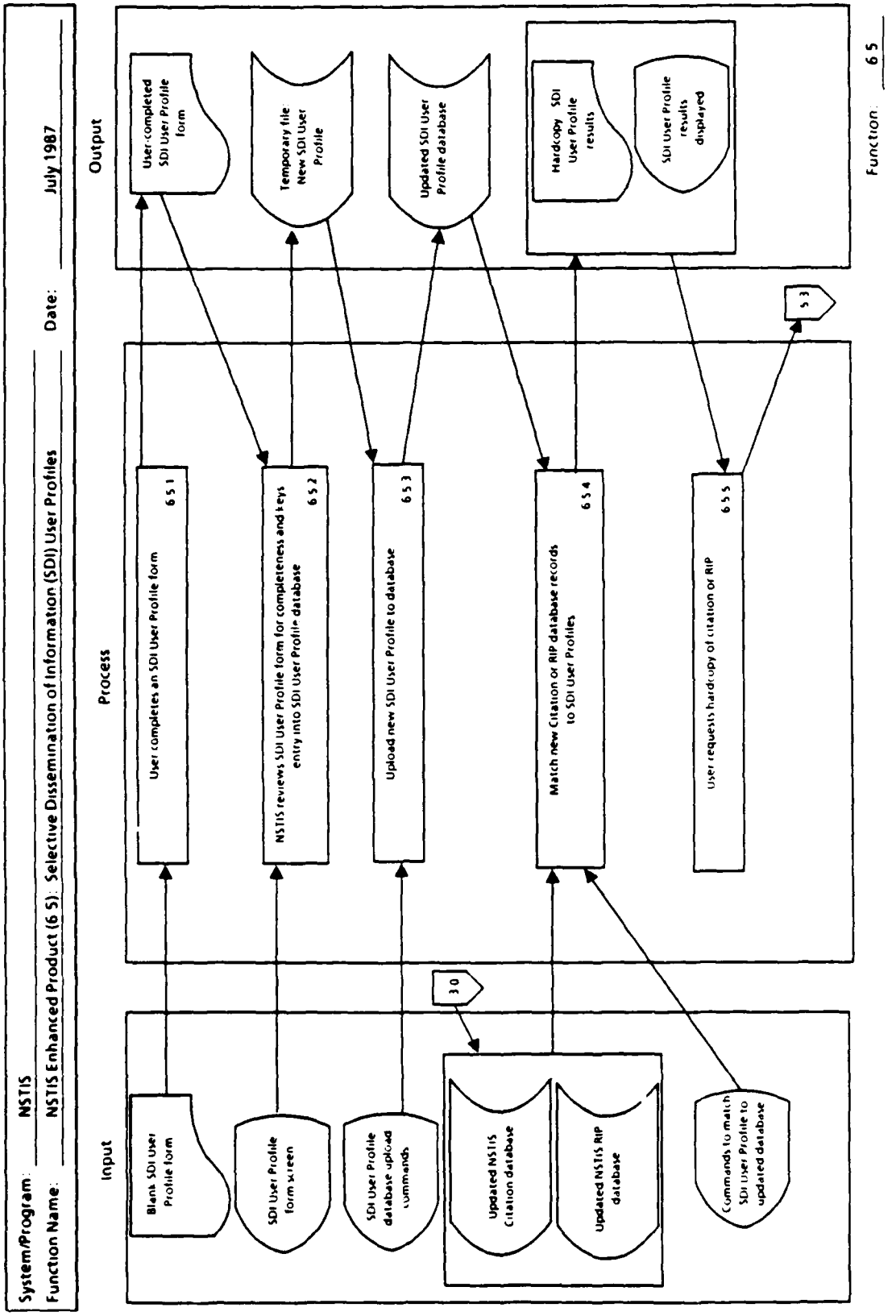


FIG. 3-14. SELECTIVE DISSEMINATION OF INFORMATION (SDI) USER PROFILES

index these documents down to the section or paragraph level of a document. This process implies more in-depth indexing.

- Match the indexed military planning and requirements documents against the STI Citation database records.
- Create a product with the software that supports subject term comparison and matching, showing which STI documents address the same (or similar) topics as the planning and requirements documents.
- Deliver reports that include the following information:
  - A report for each planning document sorted alphabetically by all subject terms in it; then, under each subject term, a list of all R&D and RIP reference numbers with the same subject term.
  - A report that sorts alphabetically all subject terms, and lists separately under each subject term the R&D and RIP records which identify the military requirements documents which contain that same subject term.

Reports such as these, as well as direct queries of the database, will show both where requirements are being addressed and where there are gaps. These are not typical bibliographic products and will require both specialized processing of the requirements documents and significant systems analysis and computer programming effort.

3.7 BASIC INTERACTION BETWEEN NSTIS AND USERS

The steps needed for users to request information from the NSTIS and the various ways in which the NSTIS can respond are described in this section.

3.7.1 How Users Submit Requests to the NSTIS

Here we discuss the proposed procedures for submitting information requests to the NSTIS. Users will be the NATO Headquarters staff, other NATO agency staffs, qualified NATO nation representatives, and NATO nations. This discussion concentrates on how the NSTIS should receive and analyze an information request.

A number of activities are set into motion when a user submits a request to the NSTIS. Inquiries may be received in person, by telephone, by written request,

or – depending on the availability of NSTIS systems telecommunications access – electronically. The procedural flow for these requests is as follows:

- Every request or inquiry, no matter how it is received at the NSTIS, is logged and assigned a control number. A record in the NSTIS Query Tracking database records the query, either as it is submitted or afterward. If the request is of a high priority, the activities described below must be expedited.
- The NSTIS must monitor these incoming requests and determine whether a request is within the scope of the NSTIS and whether the requester is a valid user. User security authorizations are determined and appropriate clearances, if not already granted, must be obtained.
- If any charges are to be incurred for services, as for example for document ordering or commercial database searching, the user must authorize the charges.
- The NSTIS staff must analyze and understand the request. If the request is ambiguous or poorly worded, the user must be asked for clarification. If the user is capable of performing his or her own database search, NSTIS staff members must be available to help formulate a query of the NSTIS or other accessible database(s).

3.7.2 Preparing a Response for a User

The NSTIS must determine in what form (or forms) the response may take. Responses can fall into a number of categories. Depending on the complexity of the response and the resources used, a response may take from several minutes to several weeks to prepare and complete. Typical response forms for the NSTIS might be:

- Off-the-shelf data, information, or documents readily accessible in NATO Headquarters.
- Questions that can be answered by NSTIS staff members on the basis of their expertise.
- Requests for readily available NATO data and information that may only require coordination with a registry to duplicate a document.
- Requests that can be filled by searching an NSTIS database(s) and delivery of a sorted and/or annotated bibliography to the user.
- Requests that require data from other NATO agencies and their information resources.

- Requests that require data from commercial databases.
- Requests that require data from NATO nation defense information resources and databases.
- Requests that require data from some or all of the available information resources internal and external to NATO.
- Guidance for the user on where to find experts in a given field whom a NATO user may wish to contact.
- Complex requests that require a great deal of definition and special processing. Such responses may reflect state-of-the-art summaries of activity in a given field or oral presentations by the NSTIS to supplement the retrieved material.

The NSTIS should keep the user apprised of the status of the request, particularly if the request is complex and may take more than a few working days.

Before a response is released to a user, the response must be subjected to quality control. The response should be checked for quality, validity, and relevance to the original request. If in the opinion of the reviewer additional work must be undertaken, the user must be informed. When quality control on the prepared response has been completed, the response may be issued to the user. Requests can be delivered in person, by telephone, by courier, or by mail. When available, response results could also be electronically delivered to a user. Each response should be accompanied by a letter (or form) of transmittal. If a user has reviewed the results of database retrieval and wishes some of the documents, the request for hardcopy must be handled by the NSTIS.

With users who have conducted their own database searching, the NSTIS should conduct follow-up to make sure the requests have been fulfilled. If more specialized services are required because of the complexity of a request, the NSTIS should be able to provide that additional assistance. To assess the needs of users and the performance of the NSTIS, comments and reactions of users should be sought, recorded, and evaluated.

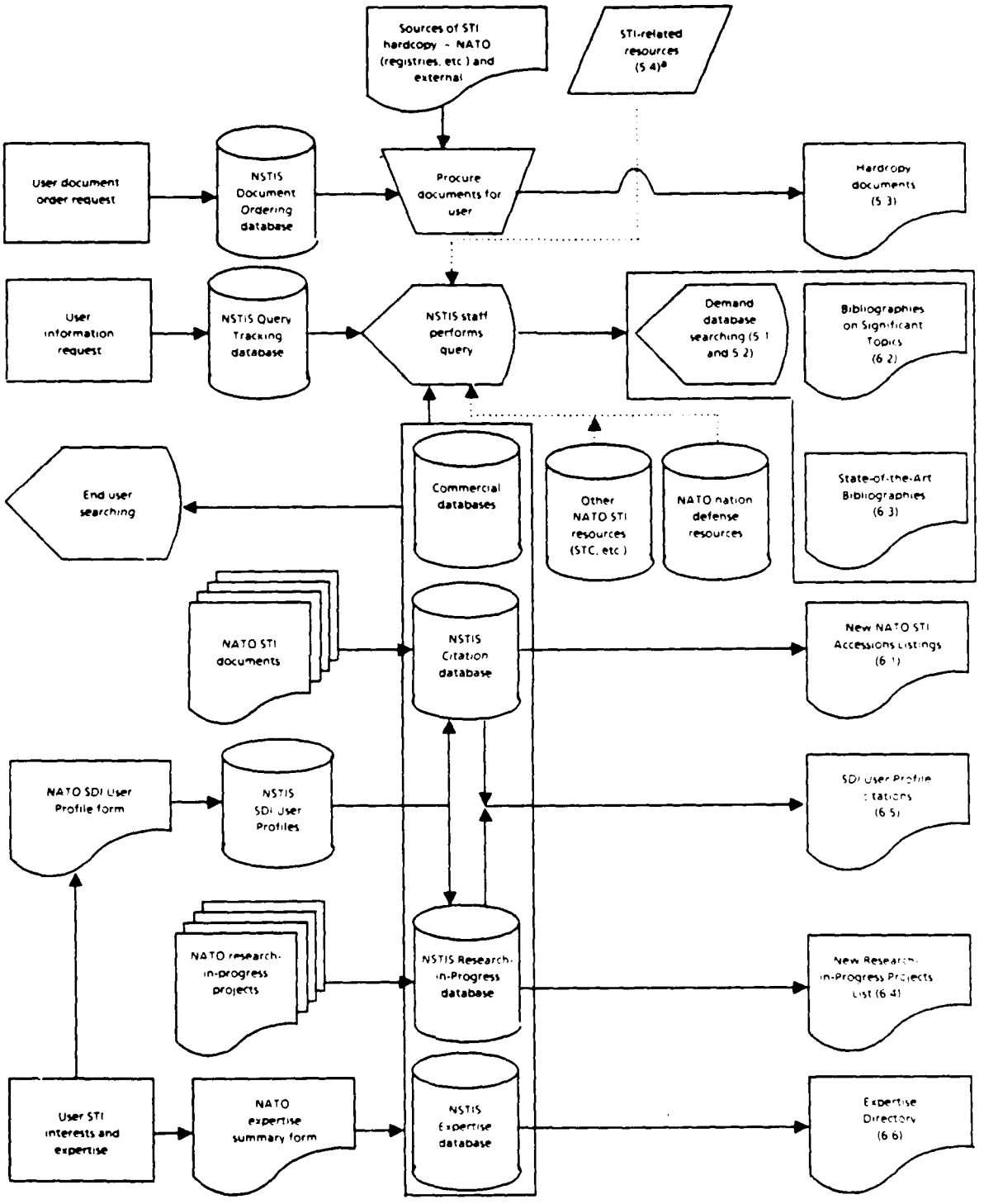
3.8 PRODUCTS AND SERVICES SUMMARY

The fundamental objective of the NSTIS is to provide NATO and NATO nation staff with answers to STI-related questions. Just as with a combat unit, in order for the NSTIS to accomplish its mission it must be able to draw on all possible resources,

have adequate support tools, and possess a staff with the professional skills to use the resources and tools.

Section 3 has defined the resources and procedures. Section 4 will define the ADP requirements (or tools) and Section 5 the staff requirements needed to provide the proposed products and services.

The mix of NSTIS products and services (summarized in Figure 3-15) are intended to meet specific NATO organization needs and the overall needs of NATO staff and supporting nations. Delivery of products and services will include both printed and online forms (each form has its own advantages). Available STI will be disseminated in a variety of ways: releases regarding new items, reviews of specific subjects, periodic listings of all holdings, etc. A variety of access points including multiple subject terms, authors, dates, and responsible organizations will be offered. Finally, all known STI resources (NATO held, commercial and public, and NATO nation) should be available and accessible.



[a] The numbers in this figure refer to the HIPO hierarchy and flow charts. Refer to Figure 3-2 for the system hierarchy.

FIG. 3-15. NSTIS PRODUCTS AND SERVICES SUMMARY

SECTION 4

ENVIRONMENT

In this section, we discuss the ADP environment at NATO Headquarters, both the present environment and the environment as it must be to satisfy the NSTIS requirements defined in Section 2 and Section 3.

4.1 PRESENT ENVIRONMENT

This section summarizes the current hardware and software environment at NATO Headquarters. Additional details can be found in Appendix J. Information regarding the current and planned NATO ADP environment is taken from the *NATO Headquarters Five Year Information Systems Plan*, SITCEN-86-410-RAD, issued 10 November 1986.

Other NATO centers are not described here, except to indicate that the STC STI database is resident on the BASIS DBMS operating on a Control Data Corporation (CDC) computer and that the SACLANTCEN STI database is running on Digital Equipment Corporation (DEC) equipment.

NATO Headquarters ADP is under the direction of the SITCEN. SITCEN has a mandate to supply both the IS and IMS with complete ADP support. This includes hardware, software, and programming to develop and maintain user applications. SITCEN also offers hardware and software resources – but not programming support – to other NATO agencies including SHAPE.

4.1.1 Present Environment: Hardware

SITCEN operates two International Business Machines (IBM) Corporation computers – a 4341 and a 4331 processor. Both computers have the usual peripheral equipment (disk drives, printers, etc., as listed in Appendix J). The machines support both batch and online operations. More than 90 VDUs distributed throughout the Headquarters building are used to access the computers. Four IBM PCs and seven CPT word processors also access the SITCEN computers. The only

external online access is by NACISA, which accesses the mainframes through a secure line, using encryption equipment supplied by NACISA.

A detailed review of hardware capacity usage in September 1986 showed that the IBM 4331 was fully utilized and that the 4341 was approaching its limit. Because of this heavy workload and the even greater resource demands anticipated, SITCEN is planning a major upgrade of both machines. Plans include doubling the memory of the 4341 and upgrading both the processor speed and the memory of the 4331. Disk storage will also be increased by five disk drives, and the terminal communications controllers will be upgraded to support a significant increase in the number of terminals and PCs that can access the computers. SITCEN will also be augmenting its computer capacity through use of PCs. There are now 22 IBM PCs for users; 250 more are to be added over the next 5 years.

The Management Advisory Unit (MAU) has also provided a number of users with PCs. The MAU, in conjunction with the Defence Support Division, is also conducting a local area network (LAN) pilot project including microcomputers, CPT word processors, and a CPT file server using the Informix DBMS. The CPT file servers are being upgraded from Office Dialog System (ODS) 100 to ODS 300 models.

4.1.2 Present Environment: Software

Both SITCEN computers use a standard IBM operating system – Virtual Memory/Conversational Monitoring System (VM/CMS). For applications support, the Common Business Oriented Language (COBOL) is the primary programming language. Other software support tools include MANTIS, CULPRIT, and SAS. Database applications have been developed on Cincom's TOTAL DBMS and document retrieval applications on IBM's STAIRS. SITCEN plans to replace both of these software packages. TOTAL will be replaced by INGRES, a recently acquired relational DBMS. STAIRS is to be replaced by competitively procured software; the Request for Proposal has been developed, and the replacement software should be obtained by early 1988.

4.2 NSTIS REQUIREMENTS

Automated support for NSTIS will require hardware, an operating system, and applications software. Most of the NSTIS requirements are fairly standard, and a number of alternatives can meet them. A detailed evaluation of the most

appropriate hardware and software to support the NSTIS will be performed during the system design and development phase. The purpose of this section is to outline essential features.

4.2.1 Hardware Requirements

The NSTIS hardware must support the following primary system functions:

- Central processing unit (CPU) to support:
  - 5,000 STI-related records a year: online, batch entry, or both.
  - Update of indexed files with new data: online, batch entry, or both.
  - Satisfactory response time (approximately 3 seconds) for online retrieval of as many as 50 simultaneous users.
- Printers to support:
  - Online production of reports of limited size.
  - Batch production of large reports.
- Storage to support:
  - 75 million characters. [This represents 5 years of NSTIS data plus 2 years of historical data but assumes inclusion of only minimal SEAD material. If all SEAD material is included, the number should be raised by 50 million characters.]
  - Tape drives to support archival storage and file transfers.
- Telecommunications, including controllers and encryption devices.
  - Remote terminal access from outside the Headquarters building.
- LAN activities within Headquarters.

These are not difficult requirements and can be satisfied by a wide range of computer sizes and types including: (1) use of SITCEN computers (if the proposed upgrades to improve response time are accomplished or additional enhancements to accommodate NSTIS needs are provided), (2) a stand-alone minicomputer, (3) super microcomputer, or (4) a combination of these resources.

4.2.2 Software Requirements

The NSTIS system will require three specific software components: DBMS, document retrieval software, and a report generator. The DBMS will support entry and updating of NSTIS data. The DBMS will also provide backup copies of files, utilities for transferring data to and from external formats (e.g., tape transfer of citations from another system such as SACLANTCEN), and other basic functions. The DBMS will make it impossible for records to be changed by two users at the same time. It will perform other data integrity functions as well. The document retrieval software will support NSTIS staff and end users in online searching of the NSTIS databases. Because it will be operated extensively by users, it is, in many ways, the most important piece. The report generator will print such products as New STI Accessions Lists and State-of-the-Art Bibliographies. Many DBMSs offered by commercial vendors support all three functions. The functions are listed separately for the sake of clarity only. For NSTIS purposes, they may be integrated or separate. If separate, they must be compatible with each other.

In addition to the software described above, a suitable computer operating system is also required. If SITCEN computers are used, the IBM VM/CMS operating system is capable of supporting the requirement. If a stand-alone system is chosen, a variety of operating systems supporting DBMS, document retrieval, and report generator software can be considered for NSTIS applications. These decisions will be made during system design and development.

4.2.2.1 Database Management System Component

The primary purpose of the DBMS in support of the NSTIS is to provide a mechanism for:

- Conveniently and efficiently entering and changing database records
- Maintaining record integrity, access security, and backups
- Providing access to records for the document retrieval and report generating components (whether they are part of the DBMS or separate software).

DBMSs are complex sets of software, with capabilities ranging from single-user, microcomputer-based systems to large-scale systems supporting thousands of transactions per minute (e.g., airline reservations). This subsection will define only the characteristics that are particularly important to the NSTIS:

- Security features to control user access to the DBMS, database, and – preferably – to a record and field within the record
- Multiple concurrent users on multiple databases
- Few limitations on the numbers of databases supported, numbers of fields per database, and numbers of characters per field – including lengthy text fields
- Variable-length records, composed of both fixed-length and variable-length fields
- Online and batch mechanisms to support data entry and editing
- Sophisticated data validation techniques including:
  - Checks for presence, length, and format
  - Authority files, including a spelling checker
  - Exit routines for user-defined validations, including cross-field validations
  - User help features
- Active data dictionary
- Application development tools
- Modifications of field sizes and formats without restructure of the database or reports.

4.2.2.2 Document Retrieval Component

The document retrieval software will be used by NSTIS staff members and end users to access NATO STI material in the databases. Generally, access will be online

through remote terminals and in the form of queries (e.g., what records discuss hand-carried, anti-tank weapons?). The system must be powerful, flexible, and easy to use. The following features are essential:

- Capacity for multiple concurrent users and databases.
- Security features to restrict user access by file level.
- Queries formulated on the basis of standard Boolean logic (i.e., AND, OR, AND NOT).
- Queries applied to any combination of fields within the records.
- Fixed formatted or unstructured text, with the text in French and English.
- Numeric text and relational operators (e.g., greater than).
- Text proximity searching.
  - Within five words.
  - Within sentence or paragraph.
  - Within specified word order.
- Root or stem and string searching – e.g., using the characters "SCIEN*" – would retrieve records that include the words "science," "scientist," and "scientific."
- Universal (or "wild card") searching – e.g., if the searcher is not sure of the spelling of a word. Therefore, "GR*Y" would retrieve both "grey" and "gray."
- Multiple relational and/or Boolean operations per search.
- User assistance (help) features.
- Sorting of retrieved records into desired sequences.
- Display of format options for retrieved records.
- Inverted files or other techniques to support rapid retrieval from large databases.
- Text indexing support features:
  - Stop word lists, eliminating the searching and indexing of such extraneous words as "the," "le," "la," "this," "cette," and the like.

- Removal of special characters.
- Equation of upper and lower cases.

The following features are desirable but not required:

- Multilevel query language (i.e., simple techniques for less advanced users and separate, more powerful techniques for sophisticated users).
- Display of history of search strategy entered during session.
- Stored search queries.
- Display the number of records in a retrieved set and user modification of query based on the results.
- Use of a thesaurus.
  - Online display of subject terms.
  - Support hierarchical arrangement of the data (i.e., broader and narrower subject terms).
- Arithmetic capabilities.

4.2.2.3 Report Generation Component

The report generator software will produce reports. These will include large listings such as New NATO Accessions Lists and SDI User Profile Announcements, which are run on a regular schedule. They should be run on a high-quality printer, and the page format should be suitable for wide distribution to NSTIS users. The report generator will also produce reports developed by individual users on an ad hoc basis, either as outputs from the query language or from the report generator directly. These should be producible on either a high-speed printer or a local printer that an end user may have. They should be available in either batch or online mode. The following specific features should be supported:

- Security features to control user access and operational controls to inhibit end-user generation of lengthy reports during peak hours
- Natural language-like code which supports both programmer requirements for complex reports and convenient use by end users
- Accept records from the selected DBMS and retrieval software
- Select subsets of the records based on Boolean logic

- Sort records on any combination of fields and in ascending or descending order
- Display any selected fields in any order
- Extensive and flexible user-defined page format capabilities, including:
  - Headers and footers
  - Page numbering
  - Insertion of constants, e.g., "AUTHOR:" for easier reading of the report
  - Bold and underlined text
  - Vertical and horizontal page definition
  - Placement of fields on a page
- Text handling characteristics:
  - Line break on word boundary or automatic hyphenation
  - Paragraph indention and spacing
  - Widow-line control, i.e., not permitting a single line of type to be placed on a separate page
- String substitution i.e., substituting text for codes or initials.

4.3 SECURITY

In ADP, there are two principal security areas. The first is the security level of the data in the database. The second, access security, is composed of the hardware and software mechanisms needed to protect the first.

4.3.1 Classification Level of the Data

There are three alternatives for the classification level of the NSTIS database contents: (1) only information about unrestricted material is included; (2) the database records themselves are unrestricted, but they can identify restricted or classified material; or (3) the database itself includes restricted or classified material.

The first alternative – using unclassified material only – is unacceptable because as much as 60 percent of NATO STI (excluding SEAD material) is restricted

or classified, and an even higher percentage of the Defence Support Division material falls in that category.

The second alternative – permitting unclassified citations of both classified and unclassified documents – is a viable one and has the advantage of reducing the security requirements of the system. It has the disadvantage of reducing the information value of the database to the NATO user community, most of whom have a classified security level. NATO users with such a security level have indicated the need to access both classified and unclassified documents.

The third alternative – including classified material in the database – has the following advantages:

- The primary users – NATO Headquarters staff members – are cleared for access to classified material.
- NATO is eventually planning to augment citations with full text. The machine-readable full text of those classified documents must eventually be classified, and to the extent that SITCEN machines represent a possible NSTIS resource, they are classified.

This alternative of a classified database has the disadvantages of making remote communications more technically complex and expensive and generally restricts free usage of the data (free usage is always a goal for an information dissemination system).

One solution to the problem of classification level is to have a mix of unclassified and classified material in the database and to allow a mix of unclassified and classified users access to the system. In this alternative, under system control, unclassified users could access unclassified data only, and classified users could see all the data. This is an optimal solution, but it requires sophisticated software and hardware security in the communications controllers, the operating system, and finally, the DBMS, retrieval component, or both. Systems of such sophistication are not readily available but should become so within the next 5 years.

Another approach to the security problem is the use of SITCEN computers to hold the main portion of the NSTIS database, NATO-generated material, and a second machine to access and process external unclassified material.

4.3.2 Access Security

Access security, that is, keeping unauthorized users away from classified data, is usually achieved through both software and hardware.

Software security typically involves permitting access to the system to authorized users only. Each user is assigned a unique, private log-on identification and password, which are stored in the computer and associated with an assigned set of privileges. Only users who provide a matching log-on identification and password can gain access to the computer. Software security is also concerned with the design of the operating system and application software so that one set of programs cannot be entered by a user through another program (or data), either accidentally or deliberately.

Hardware security is achieved by simply restricting the availability of terminals and other devices connected to the system. NATO Headquarters now relies heavily on this approach. With the exception of NACISA, all terminals accessing SITCEN computers are in the secure area, where only cleared personnel are admitted. Their workstations are hardwired directly to the SITCEN computers.

Telecommunications makes access security more complex since it increases the ability of unauthorized persons to access the system. Costly encryption and decryption devices and secured communications lines are required to prevent unauthorized access. But telecommunications is also the most cost-effective way for authorized NATO community users to share information and access external STI. An example of this access: There is software (see Subsection 3.3.1.3) that enables users to query multiple external databases by means of a single, easy-to-use command language and to merge the results with the results of a parallel query run against the NATO Citation database. The result is a single combined list.

These security considerations dramatically affect the system configuration and physical location of the NSTIS computer system. If the system is placed on SITCEN equipment, it will automatically be considered classified because of the other applications on the system. A stand-alone system that contained unclassified data only, and was placed outside the NATO Headquarters secure area, would reduce the access barriers but would also restrict access severely to SITCEN systems and the

Headquarters building terminal network. Table 4-1 highlights the more probable alternative configurations.

TABLE 4-1

ALTERNATIVE NSTIS SYSTEM CONFIGURATIONS AND IMPACT ON SECURITY

Computer(s) located on	Classification level	Comments
SITCEN	Classified	NATO STI readily available to NATO HQ users Telecommunications to non-HQ NATO users costly No direct link with external STI resources
Stand-alone	Classified	Same as above but reduced linkage to related NSIB and registry databases
Stand-alone	Unclassified	Telecommunications access for non-HQ NATO users and access to external STI are more convenient, but NATO STI is of reduced value because records will be unclassified
SITCEN combined with stand-alone	Classified combined with unclassified	Telecommunications access for non-HQ NATO users is costly Telecommunications access to external STI is convenient, and a link between NATO and external STI is possible

4.4 DATABASE AND SYSTEM INTERFACES

There are three major areas of computer system interfaces between the NSTIS and other systems: other Headquarters information systems, STI systems in other NATO centers, and external STI systems (commercial and national).

As indicated in Section 2.5, "Relation With Other NATO Databases," the source material for the NSTIS Citation database (NATO STI documents) is closely related to the work of the automated registries, the NSIB, office automation, and translation services. STI material is a subset of the material to be processed by the registries, and that work should be shared in some manner. Users of the NSTIS database will want access to the Standardisation Agreements (STANAGs), Allied Publications (APs), and other material in the NSIB. Many users of the NSIB will also want access to the NSTIS Citation and RIP databases. Office automation and translation services both represent potential sources for citation input and (eventual) full-text input.

The second interface is the relationship between the NSTIS databases and the databases of other NATO STI resources, specifically STC and SACLANTCEN. These centers now catalog and enter citations into their STI databases of both NATO

and external STI material. It is a desirable goal to share the cataloging results of NATO STI among NATO centers and to provide mutual access to the databases.

The third interface is the relationship between NATO and external STI. There are many external commercial databases [e.g., INSPEC, European Space Agency (ESA), and DIALOG] as well as NATO nation databases which would be of value to NATO STI. Technical, security, and policy issues will have to be resolved before this goal can be reached.

The extent of NSTIS interfaces to other systems depends on a number of determinations to be made in the system design and development phase, including whether the NSTIS will be a stand-alone system or incorporated with other NATO information projects on expanded SITCEN resources or reside in both environments.

SECTION 5

COST FACTORS

Two major cost areas are associated with the establishment of the NSTIS: start-up costs and continuing operational costs. Preliminary cost estimates for these two areas are provided for two alternative system configurations as proposed by the NATO/AGARD WG-01; namely, a stand-alone computer configuration versus sharing SITCEN computers with other NATO ADP projects. The cost factors discussed in this section are tentative estimates.

5.1 ESTABLISHING THE NSTIS

Table 5-1 shows the five major categories of cost necessary to establish the NSTIS. The table also shows low-end and high-end costs for each category. The low-end costs reflect establishing the NSTIS primarily through the use of current (and expanded) SITCEN ADP resources. The high-end costs reflect drawing upon a combination of both SITCEN and stand-alone resources (see Section 4.3). The following paragraphs detail the five categories in Table 5-1 for both ranges of costs.

Low-end costs of US$177,500 shown in the subtotal for line item 1 reflect the acquisition of 15 terminals, 10 printers, an additional disk drive and associated cabling to support NSTIS requirements. A CPU upgrade will also be required, although the extent of the additional resources needed (and hence the cost of the upgrade) cannot be determined until a detailed analysis of the impact of the NSTIS on SITCEN resources can be completed; however, for estimate purposes, the cost of an IBM 4381 CPU prorated for NSTIS use has been included. Whether a shared 4381, for example, would have the capacity to meet NSTIS requirements will have to be determined. The high-end cost of US$211,500 includes a complete stand-alone computer including peripheral equipment such as tape drives, disk storage devices, terminals, and high-speed and local printers.

Line item 2 describes installation costs for both ranges. The costs vary according to the amount of equipment to be installed.

Line item 3 covers the DBMS, document retrieval, and report generating software necessary to support the NSTIS. The cost figure for the low-end range cannot be determined at this time; a prorated estimate, based on the cost of BASIS, has been included. Whether software currently licensed and in use by SITCEN will be appropriate and adequate to meet NSTIS processing requirements or whether new software will have to be acquired will be decided at a later date.

TABLE 5-1

ESTIMATED COSTS TO ESTABLISH THE NSTIS

Cost Category	Low-End Cost Range (US dollars)	High-End Cost Range (US dollars)
1. Hardware upgrade/acquisition		
CPU	$80,000.*	$114,000.
Terminals (15 @ $1250.)	18,750.**	18,750.
Printers (10 @ $4250.)	42,500.**	42,500.
Disk Drive	30,000.**	30,000.
Cabling (25 @ $250.)	6,250.**	6,250.
SUBTOTAL, Hardware:	$177,500.	$211,250.
2. Site preparation and hardware installation (including electrical wiring, environmental air conditioning, physical security enhancements, local network installations)	10,000.	50,000.
3. Software acquisition	18,000.*	80,000.
4. Systems development (including software modification)	120,000.	120,000.
5. Training	75,000.	75,000.
6. Cataloging, abstracting, and entering 2 years of historical STI material	125,000.	125,000.
TOTALS: US dollars	$525,500.	$661,500.
Belgian francs @ 40/US$1	21.02 million	26.46 million

* Estimate based on pro rate cost of IBM 4381 CPU running BASIS.
** In budget for procurement during FY 88.

Line item 4 describes the personnel costs required for systems development. This phase includes performing the detailed analysis and preparation of the specification, developing operational procedures, system testing, acquisition of the initial document population, and a variety of other tasks.

Line item 5 is the estimated cost of training both NSTIS staff and end users. Costs were estimated assuming a full-time training consultant available for 18 months.

Line item 6 is the cost of cataloging, abstracting, and entering 2 years of historical STI material. Costs for line items 4 through 6 are relatively independent of the hardware and software solutions selected and are, therefore, the same across the cost range.

The sum of the line items amounts to US$537,500 for the least expensive implementation method and US$661,500 for a combined SITCEN/stand-alone implementation.

5.2 ANNUAL OPERATING COSTS

Table 5-2 shows the annual operating costs for the Service. Hardware and software maintenance represent payments to the commercial supplier of equipment and software packages to supply routine and emergency maintenance, and provide standard updates. Consumables represent the routine office supplies and expenses. External STI database costs represent fees paid to commercial database suppliers (e.g., INSPEC and DIALOG) who generally charge per hour of searching. These charges amount to a total of between US$30,000 and US$65,000 annually with the variance depending on the amount of hardware and software acquired specifically for the NSTIS (Table 5-1 line items 1-3).

TABLE 5-2

ESTIMATED ANNUAL OPERATING COSTS OF THE NSTIS

Cost Category	Low-End Cost Range (US dollars)	High-End Cost Range (US dollars)
1. Hardware/software maintenance	$10,000	$35,000
2. Consumables	20,000	20,000
3. External STI database searching costs	10,000	10,000
TOTALS: US dollars Belgian francs @ 40/US$1	$40,000 1.6 million	$65,000 2.6 million

5.3 NSTIS STAFF

NSTIS operating functions can be divided into two areas. First are those functions relating to the preparation of input to the databases, including bibliographic citation preparation, abstracting, subject indexing, and data entry. Second are the output functions — providing products and services to the user. It is estimated that providing the output services will require an A-level information specialist and a B-level clerk. The staff requirements for performing input functions will depend on the level of

coordination and assistance which can be achieved with other NATO organizations (organizations creating the documents, registries, other STI centers, etc.) to assist in the input processes. If all input is handled by other organizations, no additional NSTIS staff will be needed. If the NSTIS performs all input functions itself, two additional A-level information specialists and an additional B-level clerk will be required.

One A-level manager should be recruited to direct the Service. The combined functions, therefore, amount to one A-level manager, from one to three A-level information specialists, and either one or two B-level clerks.

5.4 ECONOMIC JUSTIFICATION

It is typical in descriptions of proposed information services and systems, particularly those involving computers, to justify the system in terms of savings in money or labor. To do this for bibliographically-oriented information systems has always been difficult.

In September 1985, AGARD held a symposium on "The Value of Information as an Integral Part of Aerospace and Defense R&D Programs." The chairman's conclusions regarding the symposium indicate that, though a good deal of useful information was exchanged, he did not think the symposium quantified the value of information. Similar studies have either been unable to quantify the results or have relied on questionable assumptions in doing so.

While we are unable to make sound estimates of the potential savings, we believe they are very substantial. We have listed below several areas of potential savings.

- The NSTIS can save NATO money by identifying potential duplication of R&D studies. Preventing the repetition of a single R&D effort would typically save more than US$500,000 (19 million Belgian francs) which would offset several years of NSTIS operating costs. Though it is reasonable to assume that such duplication does not occur often in NATO itself, it may be more frequent among member nations. The potential savings of better STI sharing are enormous.

- The NSTIS can save NATO money by providing project scientists and engineers with better information about related or earlier projects. As a result, they can save time and money by using previously developed techniques and avoiding research paths that have already proved unproductive.

- The NSTIS can save NATO money by reducing the amount of NATO staff time spent trying to identify and obtain both NATO and external STI.

- The NSTIS can save NATO money by helping to eliminate the redundant processing of STI documents (and other materials) by establishing cooperative information processing policies with the various centers that receive the same documents (IMS and IS Registries, NSBI, STC, SACLANTCEN, SHAPE, etc.).

- The NSTIS can save NATO money by reducing the amount of effort spent by new staff members in assimilating the work that has preceded them, as well as the current work of related groups.

Last, but hardly least, improving the flow of STI within NATO and the Alliance countries should not only save money but should lead to the development of improved technology to meet the needs of the Alliance in preserving the peace.

SECTION 6

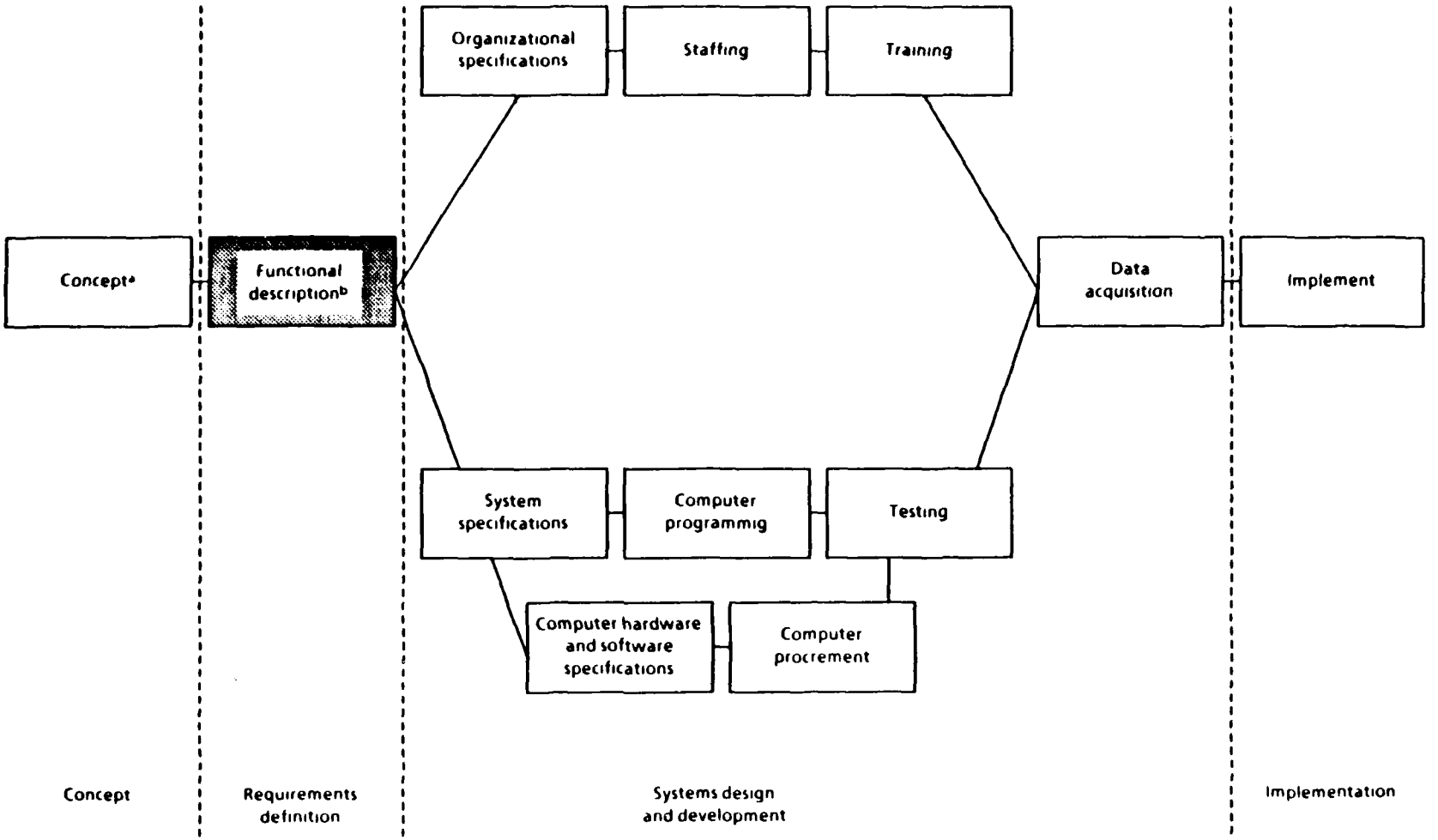
SYSTEM DEVELOPMENT PLAN

The NATO/AGARD WG-01 proposal defines the four stages of the development life cycle: Concept, Requirements Definition, Systems Design and Development, and Implementation (pp. 37–41). This FD is the culmination of the second phase and defines *what* is to be done. The system design and development phase will consist of two tasks. The first task will be the preparation of a system specification document which will define *how* the system is to be developed. The second task is the actual implementation (programming, etc.) performed under the guidance of the specification. This section provides an overview of the final two phases of the NSTIS life cycle.

6.1 SYSTEMS DESIGN AND DEVELOPMENT OBJECTIVES

The System Design and Development Phase (as illustrated in Figure 6-1) can be broken down further into the following steps:

1. Conduct a detailed analysis of alternative methods of meeting the requirements. For instance, is it more desirable and practical to enter citations by reading forms through an OCR or by online keying?
2. Present the most cost-effective solutions to NATO management in the form of a system specification document. The document will recommend:
   - Information processing policies, organizational requirements, and operating procedures to be implemented
   - Details for developing NSTIS products and services, with the DBMS, report generator, and document retrieval software components selected
   - The hardware and software requirements (and if necessary procurement steps).
3. Complete staffing and programming and arrange for any necessary procurements, upon approval of the system specification by NATO management.
4. Perform systems testing, as programming is completed.



[a] Completed April 1986

[b] Completed July 1987 with delivery of this report

FIG. 6-1. NATO SCIENTIFIC AND TECHNICAL INFORMATION SERVICE DEVELOPMENT LIFE CYCLE FROM THE NATO/AGARD WG-01 REPORT

NATO UNCLASSIFIED

5. Gather STI from the previous 2 years and historically important older material and catalog the items in preparation for the availability of the computer system. This step is to be concurrent with steps 3 and 4. This period can also be used to test operational methods and procedures and document those procedures in the NSTIS operations manuals.

With the completion of this last step, the NSTIS should be fully operational.

6.2 DETAILED SYSTEMS ANALYSIS AND SYSTEM SPECIFICATION

The detailed analysis, using this FD for the NSTIS as a basis, will consider design alternatives to determine and propose the most cost-effective means of meeting NATO requirements. The proposals will be defined in a system specification report with three major sections: policy, organizational, and procedural specifications; computer programming and operations specifications; and computer hardware and software specifications. It is important to note that these areas are interrelated. Decisions regarding one affects the others. For example, a decision to allow remote telecommunications access to the database from such centers as SACLANTCEN or member nations will affect security requirements and the costs for acquiring secure telecommunications equipment. The following subsections highlight some of the topics to be addressed by the three sections of the specification.

6.2.1 Policy, Procedural, and Organizational Specifications

As its title suggests, this section of the specification is subdivided into three parts (noted under each part are examples of issues to be addressed in it):

- STI Processing Policy
  - What priorities will be established in the phased development of services to be offered and user groups to be served?
  - With what historical documents will the database begin?
- Organizational Requirements
  - How many personnel will compose the NSTIS staff, what qualifications will be needed, and what will their duties be?
  - Where will the NSTIS be placed within the NATO organizational hierarchy and where will it be physically located in the Headquarters building?

- Methods and Procedures
  - What technologies will be used to enter data into the database?
  - How will NATO-generated STI be submitted to the NSTIS?
  - Which organizations will develop the major portions of the core record, abstract, and subject terms?
  - How will updates to existing material be processed?

6.2.2 System Specification

This section will relate directly to computer programs and procedures to be developed, using the DBMS, document retrieval, and report generator software to support the operations of the service. This section will address the following:

- Define database format and structure
- Define security requirements and procedures
- Define routine database operations
  - Database backups
  - Updates of indexed files
  - Production of periodic reports
  - Transfer of data to and from other centers and information resources
- Define input screens for data entry
- Define programs to yield output products.

6.2.3 Specification of the Hardware and Software Configuration

This section will define the hardware and software necessary to support the NSTIS. The substance of this section will depend significantly on whether or not the SITCEN hardware and software can satisfy the requirements. If SITCEN resources can be used, this section will identify the necessary components and resources that must be enhanced, additionally be made available for NSTIS use (e.g., terminals), or both. If a stand-alone system is required, this section will be more extensive; it must rigorously define the system's requirements so that the system may be procured competitively.

Related to, but independent of, the computer configuration will be the requirements telecommunications capabilities. These may include: modems, encryption devices, controllers, and communications lines. Telecommunications security will also have to be addressed.

6.3 SYSTEM DEVELOPMENT

This phase will include development of NSTIS-specific programs from the DBMS, document retrieval, and report generating software. This will include programs like the one to produce the New STI Accessions List as illustrated in Figure I-2 in Appendix I. All programming should be guided by the requirements defined in this FD and detailed in the system specification.

If hardware or software is required, a Request for Proposal may have to be developed and issued. Proposals will have to be reviewed and evaluated, and a finalist vendor must be selected. Programming may have to wait until successful acquisition of the system.

A formal plan of system acceptance should be developed. As programming is completed, test data will be entered into the databases and all functions reviewed against the test plan. Acceptance must be agreed to by both the programming and the NSTIS staff.

In parallel to computer systems development, the remaining NSTIS staff can be recruited and begin developing and documenting the operational procedures. This would include establishing contacts with the NATO staff, determining and contracting with specific external resources, developing forms, collecting the initial population of database records, and conducting a number of other activities.

System testing will include not only computer components, but also the policy and procedural aspects. Without doubt, some aspects of the original specifications will have to be changed to meet the reality of events.

6.4 IMPLEMENTATION

This step represents actual operation of the NSTIS and the end of the development phase. However, change will continue. At first, there will be changes caused by events that were not encountered during system testing. These events should dwindle in importance in a few months. Subsequent changes will occur as

new technologies develop, and the needs of the users shift and expand. Change should also occur as NATO develops an overall IRM plan in which the NSTIS will be a major component.

6.5 RESOURCE REQUIREMENTS

The effort to perform the alternatives analysis and develop the system specification document is likely to require 1,000 hours of experienced systems analysts' time. The work can be performed in approximately 3 to 5 calendar months. Since there is no information science background within NATO Headquarters to guide the effort, the systems analysis team should include library automation or information systems experience, as well as computer systems expertise. We suggest that the A-level manager be hired and available to direct the team.

Using manpower costing figures derived from the SITCEN "NATO Headquarters Five Year Information Systems Plan," we find that an average month of systems analysis by SITCEN personnel costs approximately US$4,800 (185,000 Belgian francs). From these figures, it would therefore cost an estimated US$28,900 (1.11 million Belgian francs) to perform the alternatives analysis and develop the system specification document. If internal NATO system- analysis/ information-systems resources are not available in the time desired, outside contractors can be used. Use of external resources would require approximately US$75,000 (2.85 million Belgian francs) to complete the third phase for design and development of the NSTIS.

Estimating time and effort for succeeding stages becomes very difficult. In approximate numbers, it should require 4 to 6 calendar months from the time NATO management approves the specifications to the completion of programming and testing. This estimate assumes there is no lag time waiting on the acquisition of hardware and software, that recruiting the NSTIS staff occurs promptly, and that programming resources are available.

APPENDIX A

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APPENDIX B

GLOSSARY

The following abbreviations and acronyms have been used in this report.

A&S	=	Armaments and Standardization
ACCS	=	Air Command and Control System
ADP	=	automated data processing
ADSIA	=	Allied Data System Interoperability Agency
AGARD	=	Advisory Group for Aerospace Research and Development
AP	=	Allied Publication
ARFA	=	Allied Radio Frequency Agency
CDC	=	Control Data Corporation
CD-ROM	=	compact disc read-only memory
CEP	=	Civil Emergency Planning
CEST	=	Concise Encyclopedia of Science and Technology
CIS	=	Communications and Information Systems
CNAD	=	Conference of National Armaments Directors
COBOL	=	Common Business Oriented Language
COSATI	=	Committee on Scientific and Technical Information
CPU	=	central processing unit
DBMS	=	database management system
DEC	=	Digital Equipment Corporation
DoD	=	Department of Defense (United States)
DRG	=	Defence Research Group
DSIS	=	Defence Scientific Information Services (Canada)

DSTT	=	Dictionary of Scientific and Technical Terms
DTIC	=	Defense Technical Information Center (United States)
ESA	=	European Space Agency
FD	=	functional description
HIPO	=	Hierarchy-Input-Process-Output
IBM	=	International Business Machines Corporation
ILL	=	interlibrary loan
IMIC	=	Insensitive Munitions Information Center
IMS	=	International Military Staff
IRM	=	Information Resource Management
IS	=	International Staff
LAN	=	local area network
LMI	=	Logistics Management Institute
MAS	=	Military Agency for Standardisation
MAU	=	Management Advisory Unit
MILREP	=	Military Representative (to the Military Committee)
MIPS	=	million instructions per second
MIS	=	management information system
NACISA	=	NATO Communications and Information Systems Agency
NADREPs	=	National Armaments Directors Representatives
NATO	=	North Atlantic Treaty Organization
NICS COA/SMDC	=	NATO Integrated Communication System Central Operating Agency/Software Maintenance & Development Centre
NSIB	=	NATO Standardisation Information Base
NSTIS	=	NATO Scientific and Technical Information Service
OCR	=	optical character reader
ODS	=	Office Dialog System (offered by CPT)

PAPS	=	Phased Armaments Programming System
PC	=	personal computer
R&D	=	research and development
REP	=	representative
RIP	=	research in progress
SACEUR	=	Supreme Allied Commander Europe
SACLANT	=	Supreme Allied Commander Atlantic
SACLANTCEN	=	SACLANT (Anti-Submarine Warfare Research) Centre
SDI	=	selective dissemination of information
SEAD	=	Scientific and Environmental Affairs Division
SHAPE	=	Supreme Headquarters Allied Powers Europe
SIC	=	Subject Indicator Code
SITCEN	=	Situation Centre
STANAG	=	Standardisation Agreement
STC	=	SHAPE Technical Centre
STI	=	scientific and technical information
TDCK	=	Scientific and Technical Documentation and Information Centre for the Royal Netherlands Armed Forces
TIP	=	Technical Information Panel (AGARD)
VDU	=	visual display unit
VM/CMS	=	Virtual Memory/Conversational Monitoring System
WG	=	Working Group

APPENDIX C

INTERVIEWS CONDUCTED FOR DEFINITION OF NATO SCIENTIFIC AND TECHNICAL INFORMATION SERVICE REQUIREMENTS

Listed below are personnel with whom the study team met as part of the NATO Scientific and Technical Information Service (NSTIS) requirements definition study. These interviews were conducted between 2 March and 25 March 1987. The interviews were conducted in person at NATO Headquarters, except where noted below.

Name	NATO Organization
Ampt, Mr. C. G .F.	International Staff (IS)/Material Management Systems Section and AC/315
Avci, Mr. K.	IS/Infrastructure Directorate
Beaton, Lt. Col. A.	International Military Staff (IMS)/Armaments and Standardization (A&S) Division
Beard, Mr. G. B. G.	IMS/Registry Service
Beraud, Mr. C.	IS/Management Advisory Unit
Boutry, Col. O.	IMS/Support Activity
Bradbury, Mr. D. L.	IS/Management Advisory Unit
Bruns, Mr. B A.	IS/Land Armaments Section
Bulca, Mr. C.	Situation Centre (SITCEN)
Cameron, Mr. R.	Supreme Allied Commander Atlantic (Anti-Submarine Warfare Research) Centre (SACLANTCEN) (by telephone and letter)
Controtti, Mr. F.	IS/Infrastructure Directorate
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Gagliardi, Brig. Gen. A.A.	U.S. Military Representative (MILREP)
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Gleckel, Col. G. G.	IMS/Communications and Information Systems (CIS) Division
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Hart, Mr. G.	Advisory Group for Aerospace Research and Development (AGARD)
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Kamminga, Lt. Col. W.	Military Agency for Standardisation (MAS)
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Meiser, Col. B. R.	IMS/A&S Division and AC/315
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Wetzelaer, Mr. T.	SITCEN
Winkler, Mrs. E.	IS/NATO Library
Young, Mr. W. A.	IS/Information Directorate

Meetings With Non-NATO Personnel

Blados, Mr. W. R.	Air Force Systems Command, Andrews Air Force Base, Maryland, U.S.
Breas, Mr. G. M.	Scientific and Technical Documentation and Information Centre for the Royal Netherlands Armed Forces (TDCK), The Hague, The Netherlands
Molholm, Mr. K. N.	Defense Technical Information Center (DTIC), Alexandria, Virginia, U.S.
Wildgoose, Ms. N.	Defence Scientific Information Services (DSIS), Ottawa, Canada and AGARD (by telephone)
Zijlstra, Mr. B. H. A.	TDCK, The Hague, The Netherlands

APPENDIX D

COMMUNIQUES SUPPORTING THE NATO SCIENTIFIC AND TECHNICAL INFORMATION SERVICE

This is a copy of a communique from the Directors of the Supreme Allied Commander Atlantic (Anti-Submarine Warfare Research) Centre (SACLANTCEN), the Supreme Headquarters Allied Powers Europe (SHAPE) Technical Centre (STC), and the Advisory Group for Aerospace Research and Development (AGARD) to the Secretary General, supporting establishment of the NATO Scientific and Technical Information Service (NSTIS). Also included is a transmittal letter, endorsing the communique, from the Scientific Advisor to the Supreme Allied Commander Europe.

TO: The Secretary General, NATO

COMMUNIQUE IN SUPPORT
OF THE PROPOSAL FOR
A NATO SCIENTIFIC AND TECHNICAL INFORMATION SERVICE

Prepared: December 1986

At a recent meeting of the Directors of SHAPE Technical Centre (STC), SACLANT ASW Research Centre (SACLANTCEN) and the Advisory Group for Aerospace Research and Development (AGARD), AGARD gave a presentation of the proposal for a NATO Scientific and Technical Information Service arising from the report of the Working Group which it had set up jointly with NATO to consider this possibility. In the same timeframe the proposal was also under review by the Director of the International Military Staff, and he has addressed a Memorandum on the subject to your Office (Ref. MCM-DFG-54-86, dated 24 September 1986).

Under the terms of the proposal an automated service would be located at NATO HQ Brussels with links to STC, SACLANTCEN, AGARD and other agencies. The service would employ professional information scientists with the responsibility for acquiring, indexing, storing and retrieving bibliographies, abstracts and source data of NATO-generated scientific and technical documents. The intention is to use modern information technology to provide, in the first instance, a range of customized services for NATO HQ Brussels staff and a measure of support to other members of the NATO community as appropriate. Thus the service would have the essential functions of the defence technical information services found in many of the NATO nations and also, on a smaller scale, at STC and SACLANTCEN.

We, as the Directors of three specialized NATO scientific agencies which from their time of inception have been aware of, and exploited, the benefits of organized information resources, consider the introduction of the proposed service to be vital to the future well-being and evolution of the Organization.

Although there is, of course, a cost for this service, we believe that the saving to NATO and to the research agencies in the nations through the reduction in duplication of work and in the waste of time caused by searching, often fruitlessly, for documents issued by NATO HQ Brussels will more than offset the financial outlay. The additional, corporate benefits of using information as a productive resource will accrue by themselves.

As the Heads of agencies which are prospective users of the service we urge you to accept the proposal and implement its recommendations as soon as practicable. At the same time we offer the participation of our respective agencies in an advisory capacity to the authority responsible for the service, both during its implementation and operation.

Dr R.R. Goodman	Dr H.L. Schiebschick	Dr J.C. Statler
Director	*Director*	*Director*
SACLANT ASW *Research Centre*	SHAPE *Technical Centre*	AGARD

SUPREME HEADQUARTERS ALLIED POWERS EUROPE
NATO UNCLASSIFIED
GRAND QUARTIER GENERAL DES PUISSANCES ALLIEES EN EUROPE

B-7010, SHAPE, Belgium

22 January 1987

LETTER OF TRANSMITTAL

TO: The Right Honourable The Lord Carrington

I endorse the attached Communique from three Directors of NATO's Technical Agencies. My office has followed the proposal for an automatic NATO Scientific and Technical Information Service, and I enthusiastically support its early implementation.

Paul Berenson

PAUL J. BERENSON
Scientific Advisor to SACEUR

APPENDIX E

PROPOSED NATO SCIENTIFIC AND TECHNICAL INFORMATION SERVICE DATA ELEMENTS

At present, six separate databases are envisioned to support the NATO Scientific and Technical Information Service (NSTIS), although several of them will not be developed during initial implementation:

- *Scientific and Technical Information (STI) Citations.* Represents the central repository of citations describing NATO STI documents.
- *Research in Progress (RIP).* Records of the status of research projects in the Defence Support Division, Supreme Headquarters Allied Powers Europe (SHAPE) Technical Centre (STC), Supreme Allied Commander Atlantic (Anti-Submarine Warfare Research) Centre (SACLANTCEN), and other NATO organizations performing or sponsoring scientific and technical studies.
- *Document Order Tracking.* Is used to help NSTIS staff members track user document requests to ensure prompt and proper delivery.
- *Query Tracking.* Records summary information regarding searches of the NSTIS, external databases, or both. Used by NSTIS to reduce work on repeated queries, develop trends in user interest, track workload, and review turnaround time.
- *Selective Dissemination of Information (SDI) User Profiles.* Is not a database in the typical sense, since this file records by subject topic (the NATO Thesaurus, fields and groups defined in Appendix F, or similar methodology) the areas of interest of individual NATO staff members. The staff member will be notified of new STI material entering the NSTIS that is assigned subject terms that match his profile.
- *Expertise Directory.* Makes available, through online query or in publishable form, a list of personnel in NATO who are experts in selected STI areas. The directory will use whatever subject terminology system is employed by the NSTIS.

Not included are the products needed for coordination of military requirements to armaments development projects; the nature of the product will require further definition.

This appendix provides a separate table for each of the databases. The tables list proposed data elements (fields, field formats, and descriptions) to be included in the database.

TABLE E-1

STI CITATIONS

Field name	Size/format	Description
Accession number	8N	A unique identifying number in the system, composed of the year and a sequential number (pattern: YY-NNNNNN).
Author(s)	30AN	Name of author. Should provide for multiple authors (pattern: last name, initials).
Title	65AN	Title of document.
Number of pages	5N	Number of pages in document.
Publication date	6N	Date document was released (pattern: YYMMDD).[a]
Publisher	30AN	Organization releasing the document.
Publisher's reference number	30AN	Reference number of releasing organization.
NATO organization	30AN	NATO organization responsible for document.
NATO reference number	30AN	NATO reference number of document.
Country of origin	4A	Nation where document was released.
Language	3A	Language document is written in.
Classification level	3A	Security classification level (secret, restricted, or unclassified).
Classification downgrade date	6N	Date of downgrade of classified or restricted documents. Detailed information regarding authority and previous classification level will be kept by the registries (pattern: YYMMDD).
Document type	2A	Type of document: report, conference proceedings, etc.
Media type	3A	Media document released in: hardcopy, microfiche, etc.
Subject terms	500AN	The STI subject terms discussed in the document. Should provide for multiple terms (2 – 6).
Abstract	2500AN	Summary description of document contents.
Supplementary notes	500AN	Pertinent comments regarding the document.
Related documents	30AN	NATO reference number of documents in a series, superseded documents, etc. Should provide for multiple occurrences.
Other document references	30AN	NATO reference number of significant documents that are not directly related, as above, but cited in the document. Should provide for multiple occurrences.

Note: A = alpha, N = numeric, AN = alphanumeric

[a] All dates will be stored internally in this pattern

TABLE E-2

RESEARCH IN PROGRESS

Field name	Size/format	Description
NATO project number	8N	A unique identifying number in the system, composed of the year and a sequential number (pattern: YY-NNNNNN).
NATO monitoring organization	4A	A code identifying the NATO organization performing or coordinating the work [e g , Defence Research Group (DRG) or STC].
NATO monitoring individual	30AN	The name of the person within the organization defined above who is responsible for the work Provide for multiple names (pattern: last name, initials).
Project title	65AN	A short descriptive title of the project
Summary date	6N	The date of the last entry or update of the data in this summary record.
Start date	6N	The date the project started.
Scheduled end date	6N	The date the project is scheduled to be completed
Actual date	6N	The date the project actually was completed.
Budget	12N	In Belgian francs, the amount of money budgeted.
Costs	12N	In Belgian francs, the amount actually spent.
Classification level	3A	Security classification level (secret, restricted, or unclassified).
Classification downgrade date	6N	Date of downgrade of classified or restricted documents.
Participating NATO nations	4A	A code for any NATO nation participating in the project. Provide for multiple names
Project contact	120AN	Contact point within the national group or NATO regarding project status. Include name, address, and telephone number.
Subject terms	500AN	The STI subject terms discussed in the document. Provide for multiple terms (2 – 6).
Technical objective	2,500AN	A narrative description of what the project is intended to achieve.
Progress description	2,500AN	A narrative description of project results to date.

Note: A = alpha, N = numeric; AN = alphanumeric

TABLE E-3

DOCUMENT ORDER TRACKING

Field name	Size/format	Description
Order number	8N	A unique identifying number in the system, composed of the year and a sequential number (pattern: YY-NNNNNN).
Requester name	30AN	Name of the individual requesting the document (pattern: last name, initials).
Requester organization	30AN	Organization of the requesting individual.
Requester telephone number	14AN	Telephone number of requesting individual.
Source organization	30AN	The organization the document is being obtained from.
Source address	120AN	Address of the organization the document is being obtained from.
Source telephone number	14AN	Telephone number of the organization the document is being obtained from.
Publisher's reference number	30AN	Reference number of releasing organization.
Document date	6N	Date document was published.
Document title	65AN	Document title.
Author(s)	30AN	Name of author; provide for multiple authors (pattern: last name, initials).
Classification level	3A	Security classification level (secret, restricted, or unclassified).
Price	4N	The price of the document in Belgian francs.
Request date	6N	Date document was requested from the NSTIS by the user.
Order date	6N	Date document was ordered from the source by the NSTIS.
Need date	6N	Date document is needed by the requester.
Deliver date	6N	Date document was delivered to the user by the NSTIS.
Status	20AN	Status of the request: complete, not available, in the mail, etc.
NSTIS staff initials	3A	Initials of NSTIS staff member processing the order.

Note: A = alpha; N = numeric; AN = alphanumeric.

TABLE E-4

QUERY TRACKING

Field name	Size/format	Description
Order number	8N	A unique identifying number in the system, composed of the year and a sequential number (pattern: YY-NNNNNN).
Requester name	30AN	Name of the individual requesting the document (pattern: last name, initials).
Requester organization	30AN	Organization of the requesting individual.
Requester telephone number	14AN	Telephone number of requesting individual.
Source organization	30AN	The organization the document is being obtained from.
Source address	120AN	Address of the organization the document is being obtained from.
Source telephone number	14AN	Telephone number of the organization the document is being obtained from.
Query classification level	3A	Highest classification level of any citation or record retrieved.
Request date	6N	Date information query was posed to the NSTIS by the user.
Query date	6N	Date query response was begun by the NSTIS.
Need date	6N	Date query response is needed by the requester
Deliver date	6N	Date query response was delivered to the requester by the NSTIS.
Status	20AN	Status of the query: complete, being developed, etc.
NSTIS staff name	3A	Initials of NSTIS staff member processing the order.
Databases searched	8AN	Names of databases searched: NSTIS, DIALOG, INSPEC, etc. Provide for multiple database names.
Query strategy	120AN	A summary of specific repetition of the query used.
Results	65AN	A description of the results of the query.
User feedback	65AN	A description of the value of the query results to the user.

Note: A = alpha; N = numeric, AN = alphanumeric.

TABLE E-5

SDI USER PROFILES

Field name	Size/format	Description
Profile number	8N	A unique identifying number in the system, composed of the year and a sequential number (pattern: YY-NNNNNN)
Requester name	30AN	Name of the individual requesting the document (patterr last name, initials)
Requester organization	30AN	Organization of the requesting individual
Requester telephone number	14AN	Telephone number of requesting individual
NATO subject terms	500AN	NATO STI subject terms of interest to the requester. Should provide for multiple terms (2 – 6).
External subject terms	500AN	External STI subject terms of interest to the requester; provide for multiple terms (2 – 6)
Databases searched	8AN	Names of databases searched. NSTIS, DIALOG, INSPEC, etc. Provide for multiple database names.
Profile date	6N	Date profile was established or last updated.
NSTIS staff initials	3A	Initials of NSTIS staff member developing the profile.

Note: A = alpha, N = numeric, AN = alphanumeric.

TABLE E-6

NATO STI EXPERTISE DIRECTORY

Field name	Size/format	Description
Identification number	8N	A unique identifying number within the system, composed of the year and a sequential number (pattern: YY-NNNNNN).
Expert's name	30AN	Name of the expert (pattern: last name, initials).
Expert's organization	30AN	Organization employing the expert.
Telephone number	14AN	Telephone number of the expert.
Expert's address	120AN	Address of the expert.
Nation	4A	Nationality of the expert.
NATO organization	30AN	NATO organization expert works with.
NATO projects worked on	500AN	Title of NATO projects worked on (should relate to RIP titles).
NATO subject terms	500AN	NATO STI subject terms for areas of expertise. Should provide for multiple terms (2 – 6).
Summary	2,500AN	Narrative description of expertise and work with NATO.

Note: *A = alpha; N = numeric; AN = alphanumeric.*

APPENDIX F

NATO SCIENTIFIC AND TECHNICAL INFORMATION SERVICE SELECTION CRITERIA FOR THE SCIENTIFIC AND TECHNICAL INFORMATION CITATION AND RESEARCH-IN-PROGRESS DATABASES

Selection criteria will have to be devised on how documents and research-in-progress (RIP) projects qualify as scientific and technical information (STI) for entry into a NATO Scientific and Technical Information Service (NSTIS) database. The proposed selection criteria are itemized below. These criteria for defining STI documents were devised by the NATO/Advisory Group for Aerospace Research and Development (AGARD) Working Group-01 (WG-01) and have since been revised by the study team.

NATO STI DOCUMENTS

Figure 1 (p. 23) and Appendix A (pp. 43 – 47) of the NATO/AGARD WG-01 Proposal for the NSTIS, defined documents to be considered for inclusion in the NSTIS database. Listed below are the eight criteria that define NATO STI, as proposed by the NATO/AGARD WG-01 with minor revisions by the study team:

1. **Origin**

   Should be included: documents that originate in NATO (documents written, prepared, and issued by NATO) and documents that are submitted to NATO (e.g., by contractors or individual nations) that are to be used within NATO and later distributed for that purpose.

2. **Subject Matter**

   Subject matter will be defined by the NSTIS subject vocabulary, which is yet to be determined. Possible alternatives might be the NATO Thesaurus, if it is adopted by AC/315 NATO Standardisation Group, or a simpler scheme such as the one illustrated in Appendix H.

3. Type of Documents

Documents that are judged to contain significant scientific or technical content and produced as the following types will be appropriate for the NSTIS database:

- Technical reports, e.g., final reports of WGs or the interim reports of major projects on R&D, tests, evaluation, logistics, and design
- Publications from the AGARD and selected publications from the Scientific and Environmental Affairs Division (SEAD)
- Supreme Allied Commander Atlantic (Anti-Submarine Warfare Research) Centre (SACLANTCEN) and Supreme Headquarters Allied Powers Europe (SHAPE) Technical Centre (STC) reports on technical projects
- Conference proceedings
- Written text of oral presentations
- Reference works, e.g., dictionaries, and indexes
- Summary records, minutes, etc., of scientific and technical panels, groups, and committees
- Course material and papers prepared by students at the NATO Defense College and similar NATO educational activities
- Management reports and planning documents on scientific and technical subjects
- Industrial studies
- Annual reports
- Operational requirements
- Exercise reports
- Concept papers
- Phased Armaments Programming System (PAPS) milestone documents.

4. Formats

Paper (both bound and unbound), microform, machine-readable, and other formats as appropriate – e.g, audio-visual tapes.

5. Languages

Documents may be in the language of any NATO nation, but specified fields of the citation record will be in both French and English.

6. Age

To be entered initially into the database, documents should have been produced in the past 2 years. Records are to be retained in the database until a total lack of future usefulness is *clearly* perceived. Database contents will be reviewed periodically.

7. Security Classification

Unlimited, restricted, and classified documents will be included. As discussed in Section 4.3 of this report, how the citations of classified NATO documents are to be handled will require further exploration during the system design and development phase.

8. Exclusions

The following types of documents will not be selected for the NSTIS database:

- Maintenance manuals
- Engineering or technical orders
- Intelligence, economic, or political documents
- Policy documents
- Correspondence
- Meeting announcements
- Administrative material (organizational and personnel matters, etc.)
- Financial and infrastructure information
- Computer programs.

RESEARCH-IN-PROGRESS PROJECTS

These projects were not addressed by the NATO/AGARD WG-01. For selection of RIP projects, several criteria are recommended by the study team:

1. Focus of the Project

The major consideration of the project is in a field of science or technology.

2. Age

The results of the project must have served as a foundation for other proposed studies. To be entered initially into the database, projects should have been conducted in the past 2 years. Records are to be retained in the database until a total lack of future usefulness is *clearly* perceived. The methodology or technology that was used may be outdated, but the results of the study or project may still be useful to NATO. Database contents will be reviewed periodically.

3. Security Classification

Reference to unlimited, restricted, and classified R&D projects will be included. As discussed in Section 4.3 of this report, how the citations of classified NATO projects are to be handled will require further exploration during the system design and development phase.

4. Origin

A project that is being conducted by a specified institution or NATO group and that is, therefore, to be excluded or automatically included.

5. Exclusions

A project that is being performed in a specific subject area that is to be excluded from the database. Projects funded by the SEAD grants that do not typically address military efforts by NATO *may not, for example,* be considered for the NSTIS database.

APPENDIX G

DESCRIPTION OF HIERARCHY-INPUT-PROCESS-OUTPUT CHARTS AND SYMBOLS

The Hierarchy-Input-Process-Output (HIPO) design methodology uses a series of charts to depict the flow of processes and data within a system. Section 3 of this functional description (FD) uses the input-process-output charts for the NATO Scientific and Technical Information Service (NSTIS). This appendix describes briefly the format and symbols used on the charts. For a more detailed explanation of the HIPO methodology, see *System Design and Documentation – An Introduction to the HIPO Method*, Harry Katzan, Jr., Van Nostrand Reinhold Company, New York (ISBN 0-422-24267-0).

HIPO CHART SYMBOLS

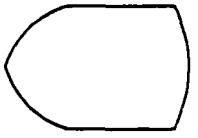
Figure G-1 shows symbols used in preparing the NSTIS HIPO charts in this FD.

HIPO CHART FORMATS

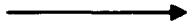
Each chart contains a heading section that identifies the system, the function or process within the system, and the date of chart preparation or latest revision. Below the heading section, the chart contains three distinct areas indicated by the large vertical boxes. The left-hand box contains the *input* symbols and descriptions, the center box contains a description of *processes* or processing in steps making use of the inputs, and the right-hand box contains the process *output* symbols and descriptions. The arrows connecting the inputs, processes, and outputs indicate the sequential relationship among the three separate elements of the chart. An input may be used by one or several processes, and a process can produce several outputs, some of which may serve as inputs to subsequent processes. In general, the order of execution for the processes begins at the top of the page and proceeds to the bottom.

The processing steps contained within each chart will be implemented as an application program or system utility. In some cases, the process may be

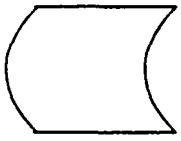
implemented as several programs because of unusual complexity or size. The charts will be refined as software selection or development progresses.



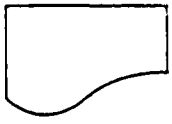
Indicates a terminal with video display and keyboard, used for entering inputs required for a process or for visually displaying the outputs of a process.



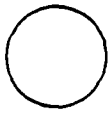
Shows the flow of inputs or outputs to or from a process. Also used to show the transfer or flow of processing control.



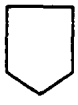
Indicates the use of online storage of files, which may be process inputs or outputs.



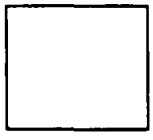
Used to indicate a document input or output for a process. Reports produced by a process are generally displayed as documents.



On-page connector used to indicate an exit to or entry from another part of the chart. The letter contained within the symbol indicates which connector is exited to or entered from.



Off-page connector used to indicate an exit to or entry from another chart within the package of system charts. The number within the symbol designates the chart to which the exit is made or from which the entry is made.



When used to enclose several symbols (such as online storage and display terminal symbols), this indicates a collection or group of inputs or outputs related to a process.

FIG. G-1. HIPO CHART SYMBOLS

APPENDIX H

ALTERNATIVE SCIENTIFIC AND TECHNICAL INFORMATION SUBJECT AREAS

If the AC/315 NATO Standardisation Program chooses not to select a NATO-wide thesaurus, the NATO Scientific and Technical Information Service (NSTIS) will have to acquire an alternative form of controlled vocabulary. If this situation develops, this appendix could serve as a starting point for defining the NSTIS subject areas of interest. This list was first proposed by the NATO/Advisory Group for Aerospace Research and Development (AGARD) Working Group-01 (WG-01) that used a list developed by the Committee on Scientific and Technical Information (COSATI). We have provided below an updated list used by the U.S. Department of Defense. The paragraphs below provide the rationale for the revision.

The need for clearer lines of demarcation among emerging technologies and between theory and militarily sensitive application, along with the need to categorize new areas of scientific and technical interest, led the Defense Technical Information Center (DTIC) to replace the COSATI Subject Category List (DoD-Modified), October 1965, with the new Subject Categorization Guide for Defense Science and Technology, October 1986 (DTIC/TR-86/16 and AD-AI72 650).

There are 25 broad subject fields and 251 groups. Three fields and 66 groups were either added or changed to provide categories for subjects that were not adequately covered by the COSATI Subject Category List (DoD-Modified). A subject can appear in several subject categories because of its applications.

1. **AVIATION TECHNOLOGY**
   Aerodynamics; Military Aircraft Operations; Aircraft; Helicopters; Bombers; Attack and Fighter Aircraft; Patrol and Reconnaissance Aircraft; Transport Aircraft; Training Aircraft; V/STOL; Gliders and Parachutes; Civilian Aircraft; Pilotless Aircraft; Lighter-Than-Air Aircraft; Research and Experimental Aircraft; Flight Control and Instrumentation; Terminal Flight Facilities; Commercial and General Aviation.

2. **AGRICULTURE**
Agricultural Chemistry; Agricultural Economics; Agricultural Engineering; Agronomy, Horticulture, and Aquiculture; Animal Husbandry and Veterinary Medicine; Forestry.

3. **ASTRONOMY AND ASTROPHYSICS**
Astronomy; Astrophysics; Celestial Mechanics.

4. **ATMOSPHERIC SCIENCES**
Atmospheric Physics; Meteorology.

5. **BEHAVIORAL AND SOCIAL SCIENCES**
Administration and Management; Information Science; Economics and Cost Analysis; Government and Political Science; Sociology and Law; Humanities and History; Linguistics; Psychology; Personnel Management and Labor Relations.

6. **BIOLOGICAL AND MEDICAL SCIENCES**
Biochemistry; Genetic Engineering and Molecular Biology; Biology; Anatomy and Physiology; Medicine and Medical Research; Ecology; Radiobiology; Food, Food Service, and Nutrition; Hygiene and Sanitation; Stress Physiology; Toxicology; Medical Facilities, Equipment, and Supplies; Microbiology; Weapons Effects (Biological); Pharmacology.

7. **CHEMISTRY**
Industrial Chemistry and Chemical Processing; Inorganic Chemistry; Organic Chemistry; Physical Chemistry; Radiation and Nuclear Chemistry; Polymer Chemistry.

8. **EARTH SCIENCES AND OCEANOGRAPHY**
Biological Oceanography; Cartography and Aerial Photography; Physical and Dynamic Oceanography; Geomagnetism; Geodesy; Geography; Geology, Geochemistry, and Mineralogy; Hydrology, Limnology, and Potamology; Mining Engineering; Soil Mechanics; Seismology; Snow, Ice, and Permafrost.

9. **ELECTROTECHNOLOGY AND FLUIDICS**
Electrical and Electronic Equipment; Fluidics and Fluerics; Lasers and Masers; Line, Surface, and Bulk Acoustic Wave Devices; Electrooptical and Optoelectronic Devices; Acoustooptic and Optoacoustic Devices; Electromagnetic Shielding.

10. **POWER PRODUCTION AND ENERGY CONVERSION (NONPROPULSIVE)**
Non-Electrical Energy Conversion; Electric Power Production and Distribution; Electrochemical Energy Storage; Energy Storage.

11. MATERIALS

Adhesive, Seals, and Binders; Ceramics, Refractories and Glass; Refractory Fibers; Coatings, Colorants, and Finishes; Laminates and Composite Materials; Textiles; Metallurgy and Metallography; Properties of Metals and Alloys; Fabrication Metallurgy; Miscellaneous Materials; Lubricants and Hydraulic Fluids; Plastics; Elastomers and Rubber; Solvents, Cleaners, and Abrasives; Wood, Paper, and Related Forestry Products.

12. MATHEMATICAL AND COMPUTER SCIENCES

Numerical Mathematics; Theoretical Mathematics; Statistics and Probability; Operations Research; Computer Programming and Software; Computer Hardware; Computer Systems; Computer Systems Management and Standards; Cybernetics.

13. MECHANICAL, INDUSTRIAL, CIVIL, AND MARINE ENGINEERING

Air Conditioning, Heating, Lighting, and Ventilating; Civil Engineering; Construction Equipment, Materials and Supplies; Containers and Packaging; Couplers, Fasteners, and Joints; Surface Transportation and Equipment; Surface Effect Vehicles and Amphibious Vehicles; Hydraulic and Pneumatic Equipment; Manufacturing and Industrial Engineering and Control of Production Systems; Machinery and Tools; Marine Engineering; Submarine Engineering; Pumps, Filters, Pipes, Tubing, Fittings, and Valves; Safety Engineering; Structural Engineering and Building Technology.

14. TEST EQUIPMENT, RESEARCH FACILITIES, AND REPROGRAPHY

Holography; Test Facilities, Equipment, and Methods; Recording and Playback Devices; Photography; Printing and Graphic Arts.

15. MILITARY SCIENCES

Military Forces and Organizations; Civil Defense; Defense Systems; Antimissile Defense Systems; Antiaircraft Defense Systems; Antisatellite Defense Systems; Military Intelligence; Logistics, Military Facilities, and Supplies; Military Operations, Strategy, and Tactics; Naval Surface Warfare; Undersea and Antisubmarine Warfare; Chemical, Biological, and Radiological Warfare; Nuclear Warfare; Space Warfare; Land Mine Warfare; Unconventional Warfare.

16. GUIDED MISSILE TECHNOLOGY

Guided Missile Launching and Basing Support; Guided Missile Trajectories, Accuracy, and Ballistics; Guided Missile Dynamics, Configurations, and Control Surfaces; Guided Missile Warheads and Fuzes; Guided Missiles; Air- and Space-Launched Guided Missiles; Surface-Launched Guided Missiles; Underwater-Launched Guided Missiles; Guided-Missile Reentry Vehicles.

17. NAVIGATION, DETECTION, AND COUNTERMEASURES

Acoustic Detection and Detectors; Non-Acoustic and Non-Magnetic Submarine Detection; Direction Finding; Countermeasures; Radio Countermeasures; Acoustic Countermeasures; Radar Countermeasures; Optical Countermeasures; Optical Detection and Detectors; Infrared Detection and Detectors; Ultraviolet Detection and Detectors; Magnetic and Electric Field Detection and Detectors; Navigation and Guidance; Land and Riverine Navigation and Guidance; Underwater and Marine Navigation and Guidance; Air Navigation and Guidance; Space Navigation and Guidance; Miscellaneous Detection and Detectors; Active and Passive Radar Detection and Equipment; Seismic Detection and Detectors; Target Direction, Range, and Position Finding.

18. NUCLEAR SCIENCE AND TECHNOLOGY

Fusion Devices (Thermonuclear); Isotopes; Nuclear Explosions and Devices (Non-Military); Nuclear Instrumentation; Nuclear Power Plants and Fission Reactor Engineering; Nuclear Fission Reactors (Power); Nuclear Fission Reactors (Non-Power); Nuclear Radiation Shielding; Protection and Safety; Radioactivity, Radioactive Wastes, and Fission Products; SNAP (Systems for Nuclear Auxiliary Power) Technology; Fission Reactor Physics; Fission Reactor Materials.

19. ORDNANCE

Ammunition and Explosives; Pyrotechnics; Aerial Bombs; Combat Vehicles; Armor; Fire Control and Bombing Systems; Guns; Rockets; Underwater Ordnance; Torpedoes; Explosions; Ballistics; Nuclear Weapons; Directed Energy Weapons; Guided Munitions.

20. PHYSICS

Acoustics; Crystallography; Electricity and Magnetism; Fluid Mechanics; Atomic and Molecular Physics and Spectroscopy; Optics; Fiber Optics and Integrated Optics; Particle Accelerators; Nuclear Physics and Elementary Particle Physics; Plasma Physics and Magnetohydrodynamics; Quantum Theory and Relativity; Mechanics; Solid State Physics; Thermodynamics; Radiofrequency Wave Propagation; Electromagnetic Pulses.

21. PROPULSION, ENGINES, AND FUELS

Air Breathing Engines (Unconventional); Combustion and Ignition; Electric and Ion Propulsion; Fuels; Jet and Gas Turbine Engines; Nuclear Propulsion; Reciprocating and Rotating Engines; Rocket Engines; Liquid Propellant Rocket Engines; Solid Propellant Rocket Engines; Rocket Propellants; Liquid Rocket Propellants; Solid Rocket Propellants.

22. SPACE TECHNOLOGY

Astronautics; Unmanned Spacecraft; Spacecraft Trajectories and Reentry; Ground Support Systems and Facilities for Space Vehicles; Manned Spacecraft.

23. BIOTECHNOLOGY

Biomedical Instrumentation and Bioengineering; Human Factors Engineering and Man-Machine Systems; Bionics; Protective Equipment; Life Support Systems; Escape, Rescue, and Survival.

24. ENVIRONMENTAL POLLUTION AND CONTROL

Air Pollution and Control; Noise Pollution and Control; Solid Waste Pollution and Control; Water Pollution and Control; Pesticides Pollution and Control; Radiation Pollution and Control; Environmental Health and Safety.

25. COMMUNICATIONS

Telemetry; Radio Communications; Non-Radio Communications; Voice Communications; Command, Control, and Communications Systems.

APPENDIX I

SAMPLE OUTPUTS OF NATO SCIENTIFIC AND TECHNICAL INFORMATION SERVICE

In Section 3 the proposed NATO Scientific and Technical Information Service (NSTIS) products and services are discussed in detail. For several of these products and services, layouts of how each may appear for delivery to the user can be suggested. For every output product that compiles STI documents or RIP project materials, the user must be provided with the means of requesting hardcopy. The study team recommends that a detachable hardcopy order form accompany each product. This form, shown as a sample in Figure I-1, will permit the user to check off records for which hardcopy is desired. These forms can then be routed back to the NSTIS. Eventually, users should be able to forward requests electronically to the NSTIS. Next, this appendix (Figures I-2 through I-6) suggests output formats for the following:

- New NATO Scientific and Technical Information (STI) Accessions List
- Bibliography on a Significant Topic
- State-of-the-Art Bibliography
- New NATO Research-in-Progress (RIP) Projects List
- Selective Dissemination of Information (SDI) User Profile.

The use of "Unclassified," "NATO Secret," and "Restricted" in the headings of these sample outputs are representational only. All records in the output samples are unclassified.

NATO UNCLASSIFIED

DOCUMENT ORDER FORM
RECENTLY ACQUIRED STI DOCUMENTS PUBLISHED BY NATO
May 1987

This Document Order Form enables you to indicate from among the records listed in the accompanying NSTIS product those for which you need the full text or hardcopy. To use this form, complete the five entries for requester data listed below. Then check off the boxes next to each abbreviated citation of those documents you need the hardcopy. Expedited processing usually means delivery of the document to you in 3 days or less. Forward the completed form to the NSTIS located in NATO Headquarters in Room NNNN. If you have any questions, call extension NNNN.

Requester last name

Requester initials

Requester organization

Requester telephone

Requester location

Building

Room number

Hardcopy requested

Normal processing	Expedite	Accession number	Title
☐	☐	87-00024	Overview of NATO and National Requirements for Digital Transmission
☐	☐	87 00025	Special Course on Interaction of Propagation and Digital Transmission Techniques
☐	☐	87 00026	Performance Measurement of the UK FHSS Anti-Jamming Modem
☐	☐	87 00027	Database Distribution for CAST
☐	☐	87 00028	Initial Assessment of the Utility of the EHF Radio Access Links in a NATO Environment

NSTIS USE

Date received (Y Y M M D D)

NSTIS staff initials

Date ordered (Y Y M M D D)

FIG. I-1. SAMPLE DOCUMENT ORDER FORM TO ACCOMPANY NSTIS OUTPUT

Unclassified[a] Sans classification Unclassified Sans classification

RECENTLY ACQUIRED STI DOCUMENTS PUBLISHED BY NATO

May 1987

Accession number: 87-00024
Author(s): Darnell, M
Title: Overview of NATO and National Requirements for Digital Transmission
Publication date: Oct 86
NATO organization: Command, Control, and Communications Systems
Subject term(s): Military communication, data transmission, digital systems, radio frequencies, troposphere, communication equipment
Abstract: This is a general introduction to the scope, objectives, and content of the Electromagnetic Wave Propagation Panel (EPP) Special Course on the "Interaction of Propagation and Digital Transmission Techniques"

Accession number: 87-00025
Author(s): Smith, D
Title: Special Course on Interaction of Propagation and Digital Transmission Techniques
Publication date: Nov 86
NATO organization: AGARD
Subject term(s): Military communication, digital systems, communication satellites, communication equipment, design, data transmission, ionosphere, antennas, wave propagation, radio frequencies, meteor trails
Abstract: The Special Course has three main objectives: (1) to provide an opportunity for engineers and scientists to learn more of propagation mechanisms and communications system design in frequency bands other than those with which they may be closely associated, thus enabling a "cross-fertilisation" of ideas to take place, (2) to attempt to identify, for the various classes of systems, the propagation measurements/data still required to enable digital communications system design to be made more precise and effective, and (3) to identify trends in the requirements and design techniques for future digital communications systems. The Special Course, sponsored by the Electromagnetic Wave Propagation Panel of AGARD, has been implemented by the Consultant and Exchange Programme of AGARD and was presented at Jevnaker, Norway, 13 - 14 October 1986, at Copenhagen, Denmark, 16 - 17 October 1986, and in Lisbon, Portugal, 20 - 21 October 1986

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[a] The use of "unclassified" in this and all other headings is for representational purposes only. All sample records are, however, unclassified

FIG. I-2. SAMPLE OUTPUT OF NEW NATO STI ACCESSIONS LIST

BIBLIOGRAPHY ON A SIGNIFICANT TOPIC: "MICROCOMPUTERS – DATA AND SOFTWARE SECURITY"

May 1987

Title: Micro-Mainframe Links Pose Array of Security Risks

Author(s): Boyd, D

Source: Computerworld, Vol 18, No 51, 17 Dec 1984, pp 41, 48

Language: English

Abstract: While micro-to mainframe links provide freedom of access, they also pose some serious security threats When purchasing a micro-mainframe software package, users should be aware of the available security options An adequate package will provide security at both the database level and the terminal or microcomputer level It should support a security log It should allow the end-user to change passwords Finally, it should support interactive, real time security

Citation: BST-8705-005

Title: Security for Shared Resources Data Protection and Access Control are Needed for Networks

Author(s): Butcher, M

Source: Micro Communications, Vol 2, No 6, Jun 1985, pp 19 – 22

Language: English

Abstract: Local area networks, along with the use of a single office microcomputer by two or more people, are becoming increasingly common The need increases for protecting files from being read, copied, altered, or accidentally deleted by unauthorized individuals The simplest security measures for small systems should incorporate two central features: access protection and data security Both these features are incorporated in a program called Chaperone, from AST Research, of Irvine, California Chaperone's capabilities are described Sample screens are shown A flow chart of a security checklist is included

Citation: BST-8705-006

[a] The use of "unclassified" in this and all other headings is for representational purposes only All sample records are, however, unclassified

FIG. I-3. SAMPLE OUTPUT OF BIBLIOGRAPHY ON A SIGNIFICANT TOPIC

NATO UNCLASSIFIED

STATE-OF-THE-ART BIBLIOGRAPHY: "ASSESSING THE USEFULNESS OF AN STI RESOURCE"

August 1987

Title: Evaluating the Technical Information Function

Author(s): Brockis, G J and Cole, P F

Source: Chemistry in Britain, Vol 3, No 10, Oct 1987, pp 421 - 423

Language: English

Abstract: Adequate awareness of all relevant technical information can be decisive in determining the success of any research project However, no adequate criteria for evaluating the contribution so made have yet been developed Neither is there any general agreement on criteria for assessing the optimum size for the technical information function This paper briefly reviews some existing pointers and examines the results of a small-scale investigation which appear to offer some new data in both areas

NSTIS Commentary: This study, developed from a survey, quantifies waste of R&D monies by not having access to background literature Well-conceived methodology

Citation: SAB-8708-001

Title: Nueu Entwicklungen in der Franzosischen Fachinformationspolitik

Translated Title: New Trends in French Information Policy

Author(s): Busowietz, M and Schmidt-Reindl, K M

Source: Nachr f Dokum Vol 35, No 1, 1984, pp 7 - 14

Language: German

Abstract: The article summarizes some new orientations and developments of the STI policy after the governmental change in France A new and enlarged context of specialized information (culture, education, and vulgarization of scientific-technical results on the one hand, and information economy, electronic publishing, and "telematics" on the other hand) was bringing about new functions for MIDIST, the coordinating institution in the STI field Main areas of the French specialized information policy are the promotion of data banks, a national network of host computers (central host QUESTEL), the use of new technologies, and the support of users as well as the vulgarization of STI

NSTIS Commentary: A large-scale, nationally-based service with expansion of STI to the general public Not particularly applicable to NATO

Citation: SAB-8708-002

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[a] The use of "unclassified" in this and all other headings is for representational purposes only

FIG. I-4. SAMPLE OUTPUT OF A STATE-OF-THE-ART BIBLIOGRAPHY

July 1987

RECENTLY AWARDED NATO RESEARCH AND DEVELOPMENT PROJECTS

NATO project number: 86-08924
NATO monitor: Command, Control, and Communications Systems
Project title: Antenna Measurements and Cross-Polarization ECM Tests Against the STC Monopulse Tracking Radar
Start date: Feb 1987
Scheduled end date: Sep 1987
Classification level: Restricted
Participating nations: GE BE
Project description: This project will conduct a series of measurements and tests on the effects of cross-polarization ECM against a monopulse tracking radar. The measurements included antenna responses for co- and cross-polarization. The tests will include the radar responses as a function of static and swept test signal polarization and the response as a function of the power ratio of two incoherent test signals which were polarized respectively parallel and orthogonally to the radar polarization.

NATO project number: 86-07953
NATO monitor: Allied Radio Frequency Agency
Project title: A Review and Comparison of Some Radio Propagation Models
Start date: Feb 1987
Scheduled end date: Aug 1987
Classification level: Restricted
Participating nations: BE US
Project description: The objective of this project is to review and compare existing models for the calculation of the transmission losses of radio waves in the VHF and UHF portions of the electromagnetic spectrum. For the comparison of the selected models, median attenuation values, derived for average terrain, will be used.

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[a] The use of "NATO Secret" and "Restricted Distribution" in this heading is for representational purposes only. All sample records are unclassified.

FIG. I-5. SAMPLE OUTPUT OF A NEW NATO RESEARCH-IN-PROGRESS PROJECTS LIST

NATO UNCLASSIFIED

Unclassified[a] | Sans classification | Unclassified | Sans classification

SELECTIVE DISSEMINATION OF INFORMATION (SDI) PROFILE

Attached are the most recent additions to the NSTIS databases that match your SDI profile. These additions are arranged first by documents and second by research and development and armaments development projects.

If you have any questions, wish to modify your SDI profile, or need further information, call the NSTIS on extension NNNN

September 1987

For: D A Facey, Air Defence Systems Directorate/IS

SDI Profile Subject Terms
- Aerial bombs
- Aerodynamics
- Antiaircraft defense systems
- Attack and fighter aircraft
- Command, control, and communications systems
- Jet and gas turbine engines
- Patrol and reconnaissance aircraft

NSTIS DOCUMENTS

Title: A Preliminary Assessment of the Effectiveness of Countermeasures against WP Tactical Air Support Communications

Subject terms: Attack and fighter aircraft; Command, control, and communications systems; Radio countermeasures

Author: de Nijs, J J

Date: Jun 1987

Accession number: 87-98652

Classification: Secret

Abstract: This note describes the effects of jamming communication links associated with WP tactical air support. Several jamming options are investigated. Measures of effectiveness are defined and results of jamming calculations are presented

Title: An Air-Threat Effectiveness Model (THEM) for Assessing Conventional Air-Ground Weapons Systems

Subject terms: Aerial bombs; Air and space launched guided missiles; Attack and fighter aircraft

Author: Owen, G P

Date: Jun 1987

Accession number: 87 87823

Classification: Restricted

Abstract: A Monte Carlo model is described which evaluates effectiveness of conventional air delivered weapons against major target complexes. The model was developed for assessment of survivability improvements for ACE infrastructure

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[a] The use of "unclassified" in this and all other headings is for representational purposes only

FIG. I-6. SAMPLE OUTPUT OF A SELECTIVE DISSEMINATION OF INFORMATION USER PROFILE

NATO UNCLASSIFIED

APPENDIX J

SITUATION CENTRE-SUPPLIED AUTOMATED DATA PROCESSING EQUIPMENT AT NATO HEADQUARTERS

This list of automated data processing (ADP) equipment was taken from the "NATO Headquarters Five Year Information Systems Plan" (Annexes 1.1 and 1.2 to Enclosure to SITCEN-86-410-RAD) dated 10 November 1986.

Central mainframe facility-installed equipment:

- One International Business Machines (IBM) Corporation 4341 processor [memory: 8 megabytes, speed: 1.1 million instructions per second (MIPS)]
- One IBM 4331 processor (memory: 4 megabytes, speed: 0.4 MIPS)
- Disk storage of 5,500 megabytes
- Three high-speed tape drives
- Two line printers
- Two communications controllers (capacity 19 lines)
- Four terminal controllers (capacity 110 terminals)
- One computer output microfiche device.

Table J-1 lists terminals and related equipment distributed within the NATO Headquarters building and nearby agencies. The list does not include micro-computers and other equipment supplied to Headquarters staff by the Management Advisory Unit.

TABLE J-1

DISTRIBUTED EQUIPMENT BY DIVISION

	WP[a]	VDU[b]	PRT[c]	MICRO[d]	Disk[e]
International Staff					
Office of the Secretary General	22	41	4	7	1,101
Political Affairs	13	2	0	1	70
Defence Planning and Policy	7	5	1	2	337
Defence Support	16	0	0	3	1
Infrastructure, Logistics & CEP[f]	18	7	0	1	112
Scientific Affairs	4	2	0	5	40
Financial Controller	4	7	1	0	0
International Board of Auditors	1	2	1	0	0
Office of Management	37	7	0	3	354
Total International Staff	122	73	7	22	2,046
International Military Staff					
Director's Office	0	0	0	0	0
Intelligence Division	4	1	0	0	1
Plans and Policy Division	2	0	0	0	0
Operations Division	1	0	0	0	9
Logistics and Resources Division	1	0	0	0	2
Communication and Information Systems Division	6	7	0	0	274
Armaments and Standardization Division	1	0	0	0	2
Secretariat	7	4	1	0	44
Military Agency for Standardisation	2	0	0	0	0
Total International Military Staff	24	12	1	0	332
External agencies[g]					
NACISA[h]	0	0	0	0	678
ACCS Team[i]	0	4	0	0	645
NICS COA/SMDC[j]	0	2	0	0	50
Total external agencies	0	6	0	0	1,373
Total	146	91	8	22	3,751

[a] Word processors

[b] Video Display Unit – a terminal

[c] Printers are remote printers linked to the mainframe only

[d] Microcomputer (or personal computer (PC))

[e] Disk space requirements are expressed in megabytes

[f] Civil Emergency Planning

[g] Equipment directly linked to mainframe only

[h] NATO Communcations and Information Systems Agency

[i] Air Command and Control System

[j] NATO Integrated Communication System Central Operating Agency/Software Maintenance Development Centre (part of NICS COA, SHAPE)


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